PRELIMINARY STORMWATER CONTROL PLAN

FOR

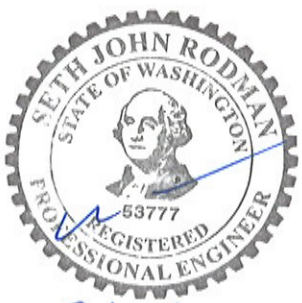
MARINERS OUTLOOK – PHASE III

SOUTH OF WEST SEQUIM BAY ROAD AND EAST OF MARINERS VIEW DRIVE FOR MARINERS INVESTORS, LTD.

Date: August 3, 2021

Project: Mariners Outlook - Phase III for Mariners Investors, LTD., south of West Sequim Bay Road and East of Mariners View Drive, Sequim

Prepared by: Zenovic & Associates, Inc.
301 East 6th Street, #1
Port Angeles, WA 98362



8/3/2021

INTRODUCTION

This Preliminary Stormwater Control Plan has been prepared to demonstrate how the proposed Phase III of the Mariners Outlook Subdivision will comply with the City of Sequim's (City) stormwater requirements for new development projects. The intent of this report is to describe the stormwater management system for the project to demonstrate compliance with the City requirements. This project includes installing asphalt roadway, sidewalk, storm, water, sewer and power utilities to serve a total of 82 residential lots. The project will be completed in 4 phases with each phase being designed to act as a standalone project (i.e. all minimum requirements will be met by each individual phase).

As the soils on this site are not well suited for on-site stormwater management and LID facilities (i.e. infiltration) this project intends to mitigate runoff from both the right of way and individual lots through the use of common stormwater treatment and detention facilities.

The City of Sequim has adopted the *2012 Stormwater Management Manual for Western Washington (DOE, amended 2014)*. As this project and the future development of the parcels will include the creation or addition of greater than 5,000 square feet of hard surfaces, this project is required to address all nine minimum requirements. This report will address each of the minimum requirements and provide information on existing conditions of the site, proposed construction and proposed methods of stormwater mitigation. Included in the Appendices are the Preliminary Stormwater Site Plans, Preliminary Stormwater Calculations, Source Control BMPs, and Soils Survey Data.

EXISTING CONDITIONS

The project site includes seven parcels (03-30-27-239050, 249080, 21180, 210140, 210130, 210050, 210125) which encompass a total of 28.12± acres. The site is currently undeveloped, but has been previously cleared. Access onto the site is from Mariners View Drive off of W. Sequim Bay Road in Sequim, WA. The site typically slopes slightly from southwest to northwest at grades between 8% and 12%. There are steeper slopes (30%±) where the project area abuts W. Sequim Bay Road and along the south property line.

The site currently receives runoff from the stormwater management system of the Cedar Ridge subdivision located directly to the west of this project. The area of the parcel that receives runoff from the Cedar Ridge Development is thickly vegetated with shrubs and grasses and appears to be frequently wet, but does not exhibit any clearly defined drainage channels.

This site receives a portion of runoff from the Mariners View Court right of way. That runoff is collected in a roadside ditch and discharged onto the site through an existing culvert. The discharge area is vegetated with grasses and does not exhibit any signs of channeling.

The site includes an existing stormwater detention pond intended to serve the previous phases of the Mariners Outlook Subdivision. This pond and the area it served will be maintained by this project and no changes to the pond or drainage area are planned as part of this project.

All offsite runoff currently discharging onto this site (with the exception of that water currently discharging to the existing onsite detention pond) will be conveyed through the proposed stormwater detention and treatment facilities prior to discharge offsite.

A portion of the Highland Irrigation District's irrigation system crosses the parcel from west to east at the south end of the parcel and from south to north at the east side of the parcel. This system is piped and eventually discharges to the roadside ditch along West Sequim Bay Road near Forrest Road. The roadside ditch downstream of this discharge location is a portion of the Highland Irrigation System.

Based on the NRCS soil survey, the onsite soils are classified as Yeary gravelly loam. Typical soil profile for these soils is: 0.7" of medial loam, 7-38" gravelly clay loam, 38-60" loam". The soil is classified as “Moderately well drained” with a depth to water table or restrictive layer 18-40”. This soil is classified as a Hydrologic Soil Group “C”.

A site investigation performed by Krazan and Associates Inc. found soils generally consistent with the mapped soil types with some exceptions. A small area of undocumented fill was encountered in the northeast corner of the site adjacent to West Sequim Bay Road and some more gravelly sandy soils were encountered in a band running east to west along the northern portion of the site. Additional information on soils and testing results can be found in the geotechnical report submitted along with this report.

MINIMUM REQUIREMENTS

The following section addresses how the nine minimum requirements apply to this project and how the project will meet these requirements.

MINIMUM REQUIREMENT #1 - Preparation of Stormwater Site Plans

Preliminary Site plans have been prepared and reduced size plans are included in Appendix A. Construction plans including Stormwater Site Plans will be prepared and submitted for approval by the City of Sequim during the Construction Permit application process.

MINIMUM REQUIREMENT #2 – Construction Stormwater Pollution Prevention

An erosion and sedimentation control plan will be prepared and submitted for approval by the City of Sequim during the Construction Permit application. The plan will include at a minimum the following stormwater pollution prevention measures:

1. Marking limits of clearing and grubbing to preserve the existing vegetation and limit land-disturbing activity.
2. Install and maintain stabilized construction entrance to prevent track-out from the site.
3. Installing temporary sedimentation and flow control basins to control flow rates and prevent sediment from leaving the site.
4. Installation of silt fencing to protect adjacent properties and waterways from sediment.
5. Installation of inlet protection to protect new and existing drainage structures and systems from sediment.
6. Limitations on the time soils may remain exposed and unworked and requirements for soils stabilization.

As this project will disturb greater than one acre of land, this project will be required to obtain coverage under the Construction Stormwater General Permit (CSGP) through the Department of Ecology. This permit will require monthly reporting of discharge conditions and preventative measures as well as weekly inspection and oversight by a Certified Erosion and Sedimentation Control Lead (CESCL). Additionally, changes will be made to the erosion and sedimentation control measures on an as-needed basis during the life of the project to ensure ongoing compliance. This permit will be obtained prior to commencement of land-disturbing activities.

MINIMUM REQUIREMENT #3 - Source Control of Pollution

All known, available and reasonable source control BMPs are required for this project. Specific source control BMPs to be employed on this project are:

- Landscaping and Lawn/Vegetation Management
- Maintenance of Stormwater Drainage and Treatment Systems
- Parking and Storage of Vehicles and Equipment
- Maintenance of Urban Streets

MINIMUM REQUIREMENT #4 - Preservation of Natural Drainage Systems and Outfalls

Historically, runoff from the project area discharged directly to West Sequim Bay. However, the installation of West Sequim Bay Road collected runoff from the site and conveyed it toward Johnson Creek to the southwest of the project site. The site currently discharges to the roadside ditch along the south side of West Sequim Bay Road. This ditch eventually discharges to Johnson Creek west of the John Wayne Marina. It is unclear how much runoff is actually discharged to Johnson Creek as the ditch is undersized for the contributing area, is not well maintained and some infiltrative soils likely exist along the ditch line.

This project will be designed and constructed to restrict flow rates from the site to pre-development flow rates per Minimum Requirement #7. Runoff that is not infiltrated onsite will be discharged to the roadside ditch along West Sequim Bay and thus the existing drainage paths will be maintained.

MINIMUM REQUIREMENT #5 - Onsite Stormwater Management

Minimum requirement #5 is intended to promote the use of low impact development BMPs to infiltrate, disperse, and retain stormwater onsite. The applicant has the choice to either meet the LID Performance Standard and implement BMP T5.13 for onsite soil quality and depth or install feasible LID BMPs per List #2 for all listed surfaces.

Based on the soil investigation and testing performed by Krazan and Associates, the site soils are varied and there as some lots that will be able to utilize onsite Low Impact Development (LID) techniques to mitigate stormwater. However, as the infiltrating areas appear to be limited, LID facilities will not be utilized to manage runoff from the roadways and sidewalks.

The following lots are expected to be able to utilized onsite stormwater management BMPs to infiltrate roof runoff: Lots 62-82 (generally those in the flat area in the northeast portion of the site). It is anticipated that all lots will implement BMP T5.13 (remediation of onsite soils for soil quality and depth).

MINIMUM REQUIREMENT #6 - Runoff Treatment

As this project will include the installation of more than 5,000 square feet of pollution-generating hard surface, this project is required to provide treatment of stormwater runoff. This project will require basic treatment of runoff as it does not exceed any of the thresholds which would require enhanced treatment of runoff. Proposed methods of runoff treatment are as follows:

A Stormwater treatment vault with filter cartridges will be installed downstream of the proposed detention facilities. This vault will be sized to treat the full two-year release rate from the detention pond in the full build-out condition of the development.

MINIMUM REQUIREMENT #7 - Flow Control

The *2012 Stormwater Management Manual for Western Washington* requires projects to provide flow control of runoff for projects which include 10,000 square feet of hard surface and discharge to fresh-water bodies which are not listed as flow-control exempt. These projects are required to the following performance standard:

"Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover."

As the impervious coverage of each lot is unknown at this time, the lots were assumed to have 4,200 square feet of impervious area (1,000 s.f. driveway, walkways and patio area) per the guidance in Appendix B of Volume III of the *Stormwater Management Manual for Western Washington (DOE, 2014).*

The project will continue to discharge to Johnson Creek and thus will be required to meet the runoff performance standard. This will be achieved through the installation of a detention/infiltration pond designed using WWMH2012. Preliminary design of this detention facility is included in Appendix B. The design of this pond does not take account for implementation of onsite stormwater management BMPs on the lots as noted above. This will be accounted for in the final stormwater pond design during the site construction permit process.

A second detention pond (Pond #1 in calculations) will be installed during the initial phase of the project to primarily reduce the peak loading on the conveyance and treatment systems within the site. Note that this pond does not initially provide full flow control from phase 1. Either a portion of the larger detention pond or other flow mitigating measures will be implemented in the design and permitting for phase 1.

As noted above, the developed project is required to match discharge durations from the site in a forested condition. This will result in a significant reduction in peak runoff rates from the existing condition of the site as it has been previously cleared and the current land cover would be defined as pasture.

MINIMUM REQUIREMENT #8 – Wetlands Protection

There are no known wetlands that will be affected by this project.

MINIMUM REQUIREMENT #9 - Operation and Maintenance

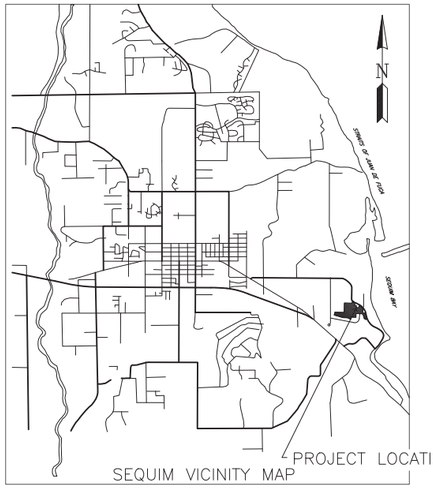
Generally those stormwater facilities located within the right-of-way will be conveyed to the City of Sequim and the City of Sequim will be responsible for the operation and maintenance of those facilities. The facilities located in the right of way will be typically limited to catch basins and associated piping.

Generally the property owners and their successors and assigns will retain ownership of those stormwater facilities located outside of the right-of-way and they will be responsible for the operation and maintenance of those facilities. The facilities located outside of the right-of-way will include catch basins and associated piping, drainage swales, stormwater detention ponds, and stormwater treatment systems (bio-swales or vaults).

An Operation and Maintenance Manual will be prepared and submitted to the City for review and approval during the Site Construction Permit application process.

APPENDIX A

PRELIMINARY SITE PLANS



SEQUIM VICINITY MAP

MARINERS OUTLOOK – PHASE III

PROJECT INFORMATION

APPLICANT: MARINERS INVESTORS, LTD.
6676 GUNPARK DR., STE. D
BOULDER, CO 80301

OWNER: MARINERS INVESTORS, LTD.

PROPOSED PROJECT: 82–LOT RESIDENTIAL SUBDIVISION

ZONING: R4–8

SETBACKS: 15' FRONT YARD
6' SIDE/REAR YARD

UTILITIES:
POWER – CLALLAM COUNTY P.U.D. #1
SANITARY SEWER AND WATER – CITY OF SEQUIM
TELEPHONE – CENTURY LINK
CABLE TELEVISION – WAVE BROADBAND

PARCEL NO.:
03–30–27–239050, 249080, 210180, 210140, 210130, 210050, 210125

DATE OF PREPARATION: JANUARY 2020

PROPERTY DESCRIPTION: PORTION OF SEC. 27, T30N, R3W, WM

AREA SUMMARY: 82 LOTS
TOTAL PROJECT AREA = 28.12 AC±
LOT AREA = 19.81 AC±
OPEN SPACE AREA = 3.22 AC±
CITY R.O.W AREA = 5.10 AC±
GROSS DENSITY = 2.92 UNITS/ACRE
NET DENSITY = 4.14 UNITS/ACRE

PHASES

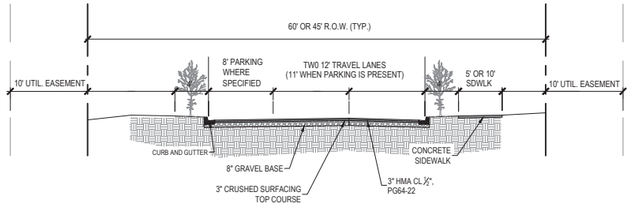
1. LOTS 1–25 (25 LOTS)
TOTAL AREA = 8.39 AC.
LOT AREA = 6.10 AC.
OPEN SPACE = 0.68 AC.
R.O.W. AREA = 1.61 AC.
GROSS DENSITY = 2.98 UNITS/ACRE
NET DENSITY = 4.10 UNITS/ACRE

2. LOTS 26–52 (27 LOTS)
TOTAL AREA = 9.02 AC.
LOT AREA = 6.75 AC.
OPEN SPACE = 0.30 AC.
R.O.W. AREA = 2.24 AC.
GROSS DENSITY = 2.99 UNITS/ACRE
NET DENSITY = 4.00 UNITS/ACRE

3. LOTS 53–68 (16 LOTS)
TOTAL AREA = 4.63 AC.
LOT AREA = 3.82 AC.
OPEN SPACE = 0.27 AC.
R.O.W. AREA = 0.55 AC.
GROSS DENSITY = 3.45 UNITS/ACRE
NET DENSITY = 4.19 UNITS/ACRE

4. LOTS 68–82 (15 LOTS)
TOTAL AREA = 6.08 AC.
LOT AREA = 3.18 AC.
OPEN SPACE = 2.20 AC.
R.O.W. AREA = 0.70 AC.
GROSS DENSITY = 2.30 UNITS/ACRE
NET DENSITY = 4.40 UNITS/ACRE

LEGEND: (UNLESS OTHERWISE INDICATED)
- ..... PROPOSED PROPERTY BOUNDARY
- ..... EXISTING PROPERTY BOUNDARY
- ..... BUILDING SETBACK
- ..... EASEMENT BOUNDARY
- ..... RIGHT OF WAY CENTERLINE

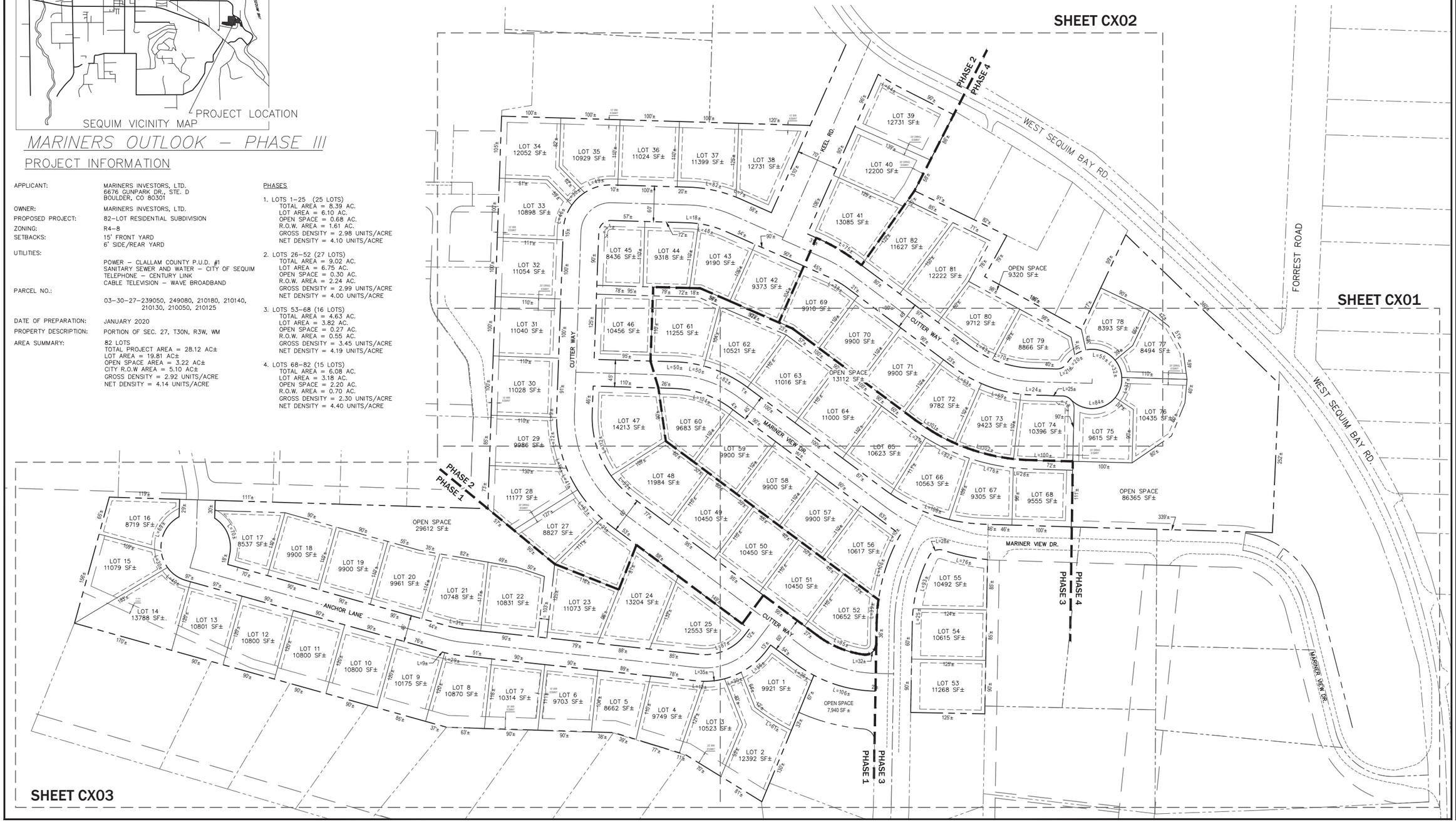


TYPICAL ROADWAY SECTION

SITE PLAN

Scale: 1" = 80'

0 80' 160' 240'



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PORT ANGELES, WA 98362
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EMAIL: ZENOVIC@ZENOVIC.NET

REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

OVERALL LOT LAYOUT

CLIENT: MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 80'

FILE: 18164–P9

JOB NO: 18164

DATE: August 3, 2021

SET: PRE–PLAT

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53777
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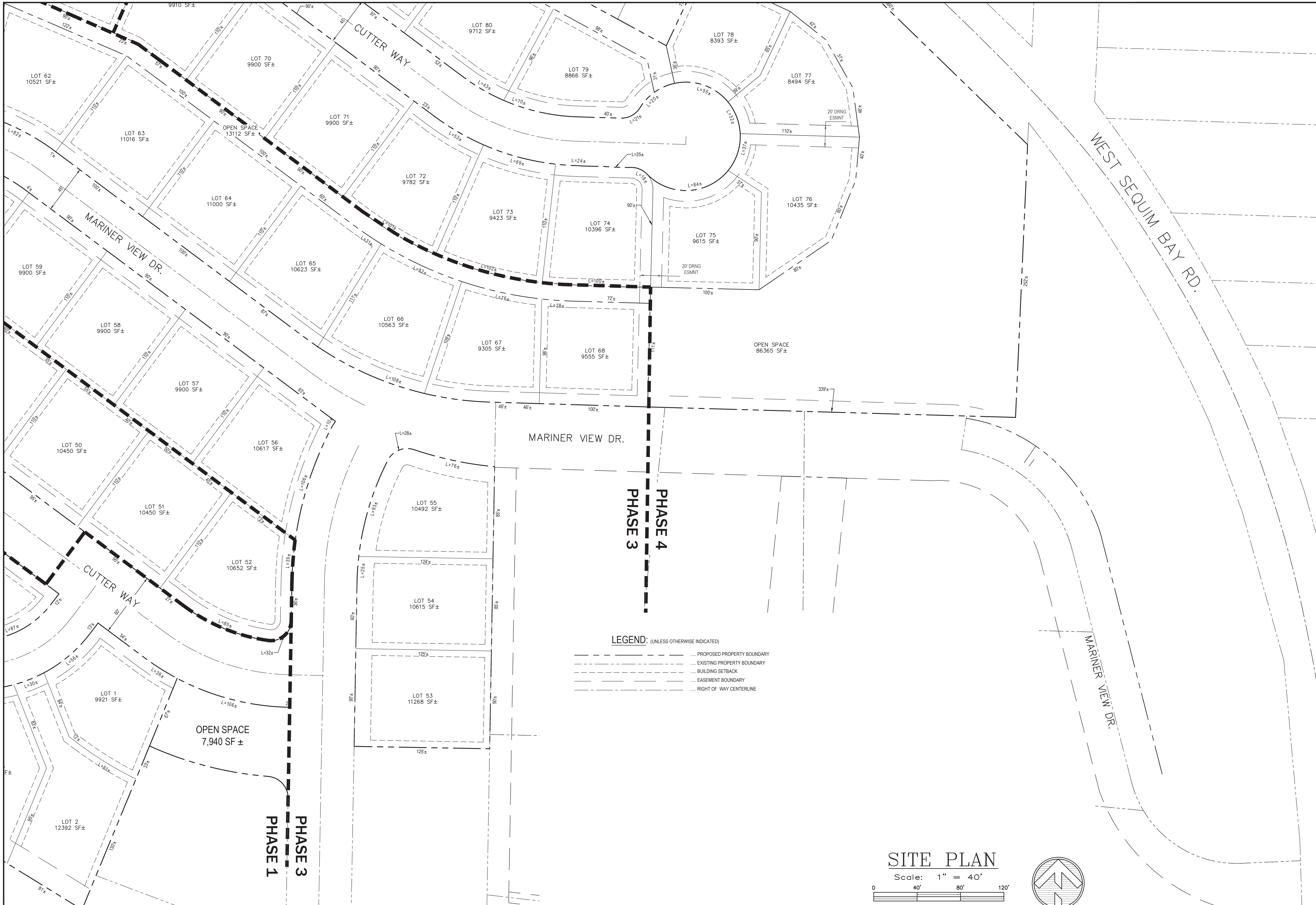
C001



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REVISIONS: DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY LOT LAYOUT - 1 OF 3

CLIENT: MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164-P9

JOB NO: 18164

DATE: August 3, 2021

SET: PRE-PLAT

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C101

LEGEND: (UNLESS OTHERWISE INDICATED)

- PROPOSED PROPERTY BOUNDARY
- EXISTING PROPERTY BOUNDARY
- BUILDING SETBACK
- EASEMENT BOUNDARY
- RIGHT OF WAY CENTERLINE

PHASE 2
PHASE 4

WEST SEQUIM BAY RD.

KEEL RD.

CUTTER WAY

MARINER VIEW

LOT 29 9986 SF±
LOT 30 11028 SF±
LOT 31 11040 SF±
LOT 32 11054 SF±
LOT 33 10898 SF±
LOT 34 12052 SF±
LOT 35 10929 SF±
LOT 36 11024 SF±
LOT 37 11399 SF±
LOT 38 12731 SF±
LOT 39 12731 SF±
LOT 40 12200 SF±
LOT 41 13085 SF±
LOT 42 9373 SF±
LOT 43 9190 SF±
LOT 44 9318 SF±
LOT 45 8436 SF±
LOT 46 10456 SF±
LOT 47 14213 SF±
LOT 60 9683 SF±
LOT 61 11255 SF±
LOT 62 10521 SF±
LOT 63 11016 SF±
LOT 64 11000 SF±
LOT 69 9910 SF±
LOT 70 9900 SF±
LOT 71 9900 SF±
LOT 72 9782 SF±
LOT 73 9423 SF±
LOT 74 10396 SF±
LOT 75 9615 SF±
LOT 76 10435 SF±
LOT 77 8494 SF±
LOT 78 8393 SF±
LOT 79 8866 SF±
LOT 80 9712 SF±
LOT 81 12222 SF±
LOT 82 11627 SF±
OPEN SPACE 9320 SF±
OPEN SPACE 13312 SF±

10' IRR ESMNT
20' DRNG ESMNT

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

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REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY LOT LAYOUT - 2 OF 3

CLIENT:
MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164-P9

JOB NO: 18164

DATE: August 3, 2021

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SHEET
C102

LEGEND: (UNLESS OTHERWISE INDICATED)

..... PROPOSED PROPERTY BOUNDARY
..... EXISTING PROPERTY BOUNDARY
..... BUILDING SETBACK
..... EASEMENT BOUNDARY
..... RIGHT OF WAY CENTERLINE

PHASE 2
PHASE 1

CUTTER WAY

ANCHOR LANE

OPEN SPACE
29612 SF±

LOT 31
11040 SF±

LOT 30
11028 SF±

LOT 29
9986 SF±

LOT 28
11177 SF±

LOT 27
8827 SF±

LOT 46
10456 SF±

LOT 61
11255 SF±

LOT 47
14213 SF±

LOT 60
9683 SF±

LOT 48
11984 SF±

LOT 49
10450 SF±

LOT 16
8719 SF±

LOT 15
11079 SF±

LOT 14
13788 SF±

LOT 13
10801 SF±

LOT 12
10800 SF±

LOT 11
10800 SF±

LOT 10
10800 SF±

LOT 9
10175 SF±

LOT 8
10870 SF±

LOT 7
10314 SF±

LOT 6
9703 SF±

LOT 5
8662 SF±

LOT 4
9749 SF±

LOT 3
10523 SF±

LOT 17
8537 SF±

LOT 18
9900 SF±

LOT 19
9900 SF±

LOT 20
9961 SF±

LOT 21
10748 SF±

LOT 22
10831 SF±

LOT 23
11073 SF±

LOT 24
13204 SF±

LOT 25
12553 SF±

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

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REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY LOT LAYOUT - 3 OF 3

CLIENT: MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164–P9

JOB NO: 18164

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LOT 62
10521 SF±

LOT 70
9900 SF±

LOT 80
9712 SF±

LOT 78
8393 SF±

LOT 79
8866 SF±

LOT 77
8494 SF±

CUTTER WAY
NEIGHBORHOOD STREET SECTION
(2) 12' TRAVEL LANES
5' SIDEWALK ON ONE SIDE

CUTTER WAY

LOT 71
9900 SF±

LOT 63
11016 SF±

10' SIDEWALK / SHARED USE PATH
TO PROVIDE TRAIL CONNECTION
TO WEST SEQUIM BAY ROAD

LOT 72
9782 SF±

LOT 64
11000 SF±

LOT 73
9423 SF±

LOT 74
10396 SF±

LOT 75
9615 SF±

LOT 76
10435 SF±

20' DRNG
ESMNT

WEST SEQUIM BAY RD.

MARINER VIEW DRIVE
NEIGHBORHOOD STREET SECTION
(2) 12' TRAVEL LANES
10' SIDEWALK ON ONE SIDE

MARINER VIEW DR.

LOT 59
9900 SF±

LOT 65
10623 SF±

12' MIN.
BERM TOP WIDTH

POND
ACCESS
ROAD

3:1 FILL SLOPES

LOT 58
9900 SF±

LOT 66
10563 SF±

LOT 67
9305 SF±

LOT 68
9555 SF±

OPEN SPACE
86365 SF±

LOT 57
9900 SF±

10' SIDEWALK / SHARED USE PATH
TO PROVIDE TRAIL CONNECTION
TO WEST SEQUIM BAY ROAD

MARINER VIEW DR.

LOT 50
10450 SF±

LOT 56
10617 SF±

PHASE 4
PHASE 3

LOT 55
10492 SF±

LOT 51
10450 SF±

MARINERS VIEW COURT
WIDEN TO LOCAL STREET SECTION
(2) 11' TRAVEL LANES
(1) 8' PARKING LANE
10' SIDEWALK ON ONE SIDE

LOT 52
10652 SF±

CUTTER WAY
LOCAL STREET SECTION
(2) 11' TRAVEL LANES
(1) 8' PARKING LANE
10' SIDEWALK ON ONE SIDE

CUTTER WAY

LOT 54
10615 SF±

LOT 1
9921 SF±

OPEN SPACE
7,940 SF ±

LOT 53
11268 SF±

MARINER VIEW DR.

SIDEWALK / SHARED USE PATH TO
PROVIDE TRAIL CONNECTION TO
WEST SEQUIM BAY ROAD, PATH
NARROWS TO 8.0' FOR LAST 225'
DUE TO GRADE RESTRICTIONS

LOT 2
12392 SF±

PHASE 1
PHASE 3

LEGEND: (UNLESS OTHERWISE INDICATED)

- ..... PROPOSED PROPERTY BOUNDARY
- ..... EXISTING PROPERTY BOUNDARY
- ..... BUILDING SETBACK
- ..... EASEMENT BOUNDARY
- ..... CENTER OF TRAVELLED WAY
- ..... EDGE OF EXISTING PAVEMENT
- ..... EDGE OF PROPOSED GRAVEL ROAD
- ..... EDGE OF PROPOSED DRAINAGE SWALE
- ..... FLOWLINE OF PROPOSED DRAINAGE SWALE
- ..... PROPOSED STREET TREE
- ..... CONCRETE SURFACING
- ..... GRAVEL SURFACING
- ..... ASPHALT PAVING
- ..... OPEN SPACE/GREENBELT

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

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REVISIONS:

DATE	MARK	NOTE

PRELIMINARY CIRCULATION PLAN - 1 OF 3

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

CLIENT: MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164–P9

JOB NO: 18164

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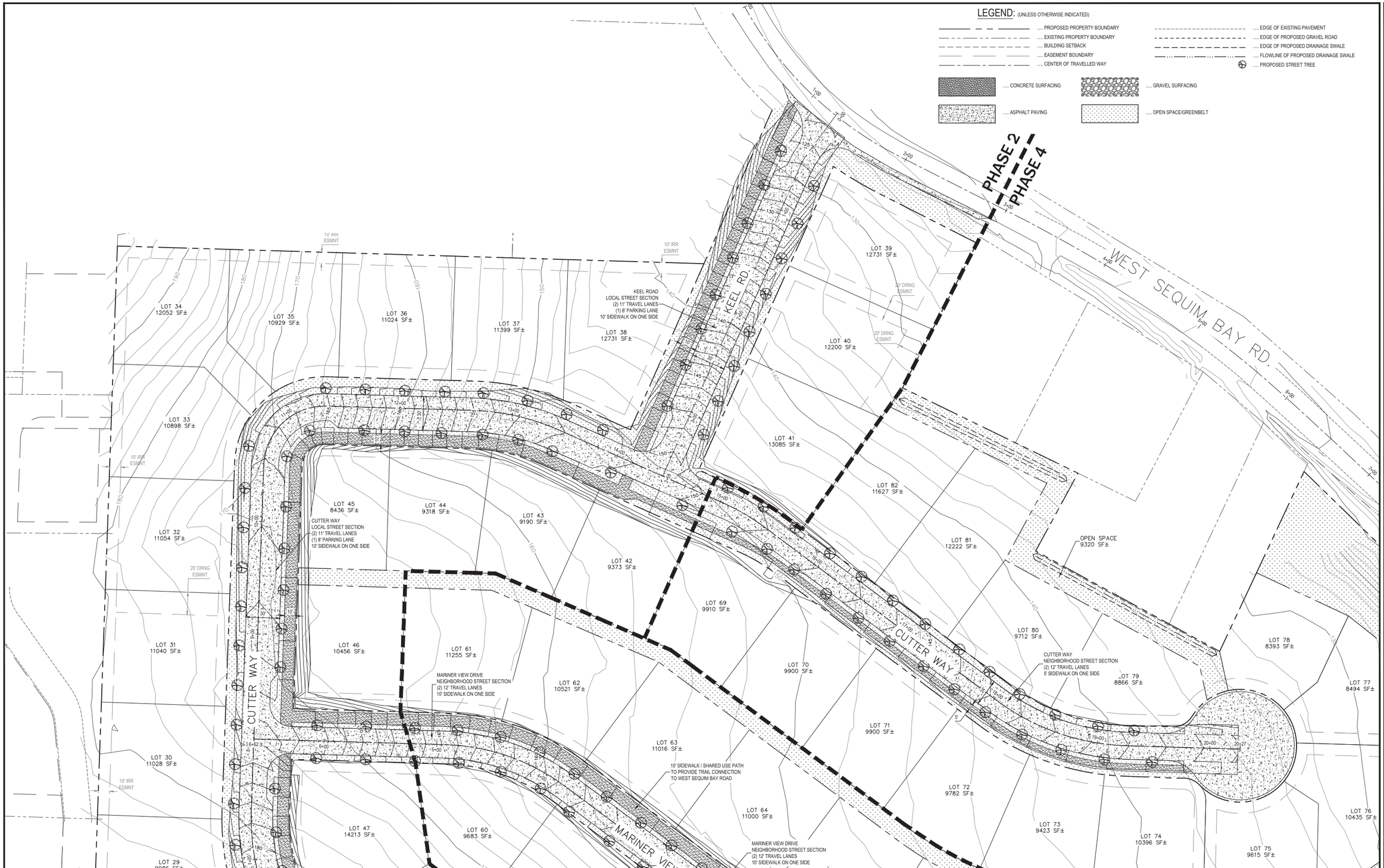

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0 40' 80' 120'

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TITLE: MARINERS OUTLOOK PHASE III - W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY CIRCULATION PLAN - 2 OF 3

CLIENT: MARINERS INVESTORS, LTD.
6879 GUNPARK DR. STE. D
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SCALE: 1" = 40'

FILE: 18164-P9

JOB NO: 18164

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SHEET
C202

LEGEND: (UNLESS OTHERWISE INDICATED)

- ..... PROPOSED PROPERTY BOUNDARY
- ..... EXISTING PROPERTY BOUNDARY
- ..... BUILDING SETBACK
- ..... EASEMENT BOUNDARY
- ..... CENTER OF TRAVELLED WAY
- ..... EDGE OF EXISTING PAVEMENT
- ..... EDGE OF PROPOSED GRAVEL ROAD
- ..... EDGE OF PROPOSED DRAINAGE SWALE
- ..... FLOWLINE OF PROPOSED DRAINAGE SWALE
- ..... PROPOSED STREET TREE
- ..... CONCRETE SURFACING
- ..... ASPHALT PAVING
- ..... GRAVEL SURFACING
- ..... OPEN SPACE/GREENBELT

PHASE 2
PHASE 1

BARRIER WITH ACCESS FOR EMERGENCY VEHICLES ONLY

CUTTER WAY

MARINER VIEW DRIVE
NEIGHBORHOOD STREET SECTION
(2) 12' TRAVEL LANES
10' SIDEWALK ON ONE SIDE

ANCHOR LANE
NEIGHBORHOOD STREET SECTION
(2) 12' TRAVEL LANES
5' SIDEWALK ON ONE SIDE

LOT 1 10523 SF±
LOT 2 10523 SF±
LOT 3 10523 SF±
LOT 4 9749 SF±
LOT 5 8662 SF±
LOT 6 9703 SF±
LOT 7 10314 SF±
LOT 8 10870 SF±
LOT 9 10175 SF±
LOT 10 10800 SF±
LOT 11 10800 SF±
LOT 12 10800 SF±
LOT 13 10801 SF±
LOT 14 13788 SF±
LOT 15 11079 SF±
LOT 16 8719 SF±
LOT 17 8537 SF±
LOT 18 9900 SF±
LOT 19 9900 SF±
LOT 20 9961 SF±
LOT 21 10748 SF±
LOT 22 10831 SF±
LOT 23 11073 SF±
LOT 24 13204 SF±
LOT 25 12553 SF±
LOT 27 8827 SF±
LOT 28 11777 SF±
LOT 29 9986 SF±
LOT 30 11028 SF±
LOT 31 11040 SF±
LOT 46 10456 SF±
LOT 47 14213 SF±
LOT 48 11984 SF±
LOT 49 10450 SF±
LOT 60 9683 SF±
LOT 61 11255 SF±
OPEN SPACE 29612 SF±

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

ZENOVIC & ASSOCIATES
INCORPORATED
301 E. 6TH STREET, SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
FAX: (360) 417-0514
EMAIL: ZENOVIC@ZENOVIC.NET

REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY CIRCULATION PLAN - 3 OF 3

CLIENT: MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164-P9

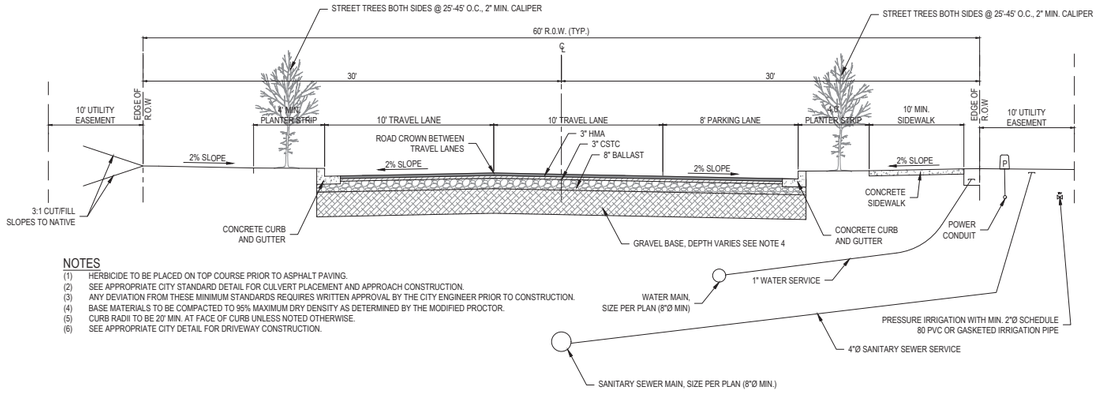
JOB NO: 18164

DATE: August 3, 2021

SET: PRE-PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

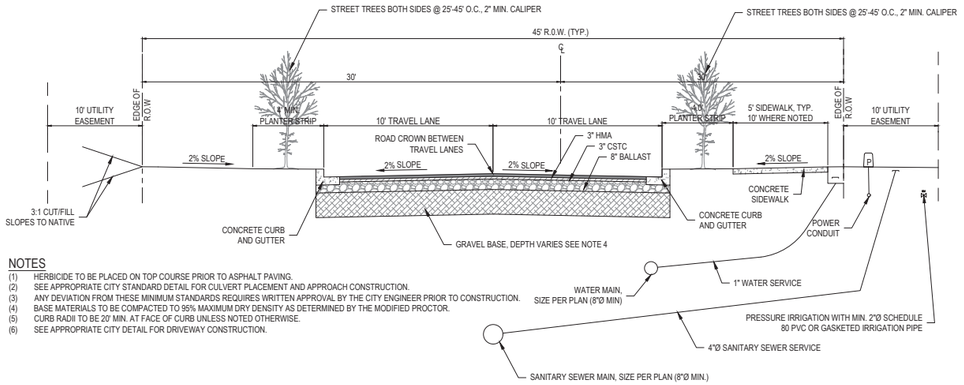
SHEET
C203



NOTES

(1) HERBICIDE TO BE PLACED ON TOP COURSE PRIOR TO ASPHALT PAVING.
(2) SEE APPROPRIATE CITY STANDARD DETAIL FOR CULVERT PLACEMENT AND APPROACH CONSTRUCTION.
(3) ANY DEVIATION FROM THESE MINIMUM STANDARDS REQUIRES WRITTEN APPROVAL BY THE CITY ENGINEER PRIOR TO CONSTRUCTION.
(4) BASE MATERIALS TO BE COMPACTED TO 95% MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR.
(5) CURB RADII TO BE 20' MIN. AT FACE OF CURB UNLESS NOTED OTHERWISE.
(6) SEE APPROPRIATE CITY DETAIL FOR DRIVEWAY CONSTRUCTION.

TYPICAL LOCAL ACCESS SECTION - 60' R.O.W.

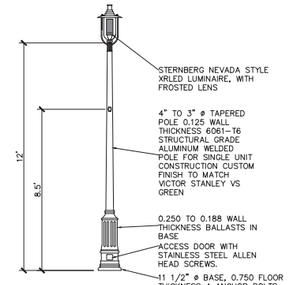


NOTES

(1) HERBICIDE TO BE PLACED ON TOP COURSE PRIOR TO ASPHALT PAVING.
(2) SEE APPROPRIATE CITY STANDARD DETAIL FOR CULVERT PLACEMENT AND APPROACH CONSTRUCTION.
(3) ANY DEVIATION FROM THESE MINIMUM STANDARDS REQUIRES WRITTEN APPROVAL BY THE CITY ENGINEER PRIOR TO CONSTRUCTION.
(4) BASE MATERIALS TO BE COMPACTED TO 95% MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR.
(5) CURB RADII TO BE 20' MIN. AT FACE OF CURB UNLESS NOTED OTHERWISE.
(6) SEE APPROPRIATE CITY DETAIL FOR DRIVEWAY CONSTRUCTION.

TYPICAL NEIGHBORHOOD STREET SECTION - 45' R.O.W.

LIGHT POLES TO BE INSTALLED AT 150' O.C. MAX ALONG THE PROPOSED RIGHT-OF-WAYS. EXACT LAYOUT TO BE DETERMINED AND SHOWN DURING CONSTRUCTION PERMITTING PROCESS



NOTES:

1. LIGHTS TO BE INSTALLED IN PLANTER STRIP 2' FROM BACK OF CURB AND AT LEAST 20' FROM STREET TREES.
2. CONTRACTOR TO COORDINATE WITH THE CITY OF SEQUIM AND THE CALLAM COUNTY PUD #1 FOR PLACEMENT OF METERS AND CONDUIT ROUTING NECESSARY TO PROVIDE A FUNCTIONING LIGHTING SYSTEM.
3. LIGHT POLE BASE MINIMUM DIMENSIONS: 18"ø x 36" DEEP.
4. LIGHTS SHALL BE INSTALLED WITH A SINGLE PHOTOCELL CONTROLLING EACH LIGHTING CIRCUIT. PHOTOCELL TO BE ATTACHED TO THE LIGHTING BREAKER CABINET.

A — LIGHT POLE DETAIL
Scale: NTS

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301 E. 6TH STREET, SUITE 1
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EMAIL: ZENOVIC@ZENOVIC.NET

REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III - W. SEQUIM BAY ROAD, SEQUIM, WA

ROADWAY SECTIONS

CLIENT:
MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: NTS
FILE: 18164-P9
JOB NO: 18164
DATE: August 3, 2021
SET: PRE-PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

SHEET
C210

LOT 62
10521 SF±

LOT 70
9900 SF±

LOT 80
9712 SF±

LOT 78
8393 SF±

LOT 79
8866 SF±

LOT 77
8494 SF±

LOT 63
11016 SF±

LOT 71
9900 SF±

LOT 72
9782 SF±

LOT 64
11000 SF±

LOT 73
9423 SF±

LOT 74
10396 SF±

LOT 75
9615 SF±

LOT 76
10435 SF±

LOT 59
9900 SF±

LOT 65
10623 SF±

LOT 66
10563 SF±

LOT 67
9305 SF±

LOT 68
9555 SF±

OPEN SPACE
86365 SF±

LOT 58
9900 SF±

LOT 57
9900 SF±

LOT 50
10450 SF±

LOT 56
10617 SF±

LOT 51
10450 SF±

LOT 55
10492 SF±

LOT 52
10652 SF±

LOT 54
10615 SF±

LOT 1
9921 SF±

LOT 53
11268 SF±

OPEN SPACE
7,940 SF ±

LOT 2
12392 SF±

SSMH-17
SSMH-25
SSMH-18
SSMH-16
SSMH-07
SSMH-06
SSMH-05
SSMH-08
SSMH-09
SSMH-19
SSMH-24
SSMH-20
(E) SSMH-02
(E) SSMH-03
(E) SSMH-04
(E) SSMH-01
CB

20' DRNG ESMNT

STORMWATER TREATMENT VAULT

STORMWATER DETENTION/INFILTRATION POND
8,000 S.F.± BOTTOM AREA
6.0' POND DEPTH
3:1 SIDESLOPES
12' MIN BERM TOP WIDTH

PROPOSED SANITARY SEWER PUMP STATION

CONNECT TO EXISTING SS MANHOLE

3"Ø SS FORCE MAIN

3"Ø SS HDPE FORCE MAIN

CONNECT TO EXISTING SS MANHOLE

3"Ø SS HDPE FORCE MAIN

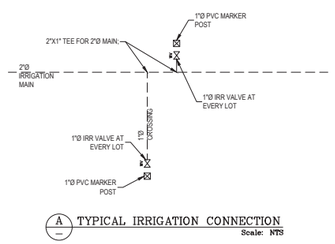
PHASE 3
PHASE 4

PHASE 3
PHASE 1

EXISTING STORMWATER DETENTION POND

LEGEND: (UNLESS OTHERWISE INDICATED)

- PROPERTY BOUNDARY
- EASEMENT BOUNDARY
- PROPOSED STORM LINE
- PROPOSED WATER LINE
- EXISTING WATER LINE
- PROPOSED GRAVITY SEWER LINE
- PROPOSED SS FORCE MAIN
- EXISTING GRAVITY SEWER LINE
- EXISTING/REALIGNED GRAVITY IRRIGATION LINE
- PROPOSED PRESSURE IRRIGATION LINE
- PROPOSED SANITARY SEWER SERVICE
- PROPOSED SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM SEWER CONNECTION
- PROPOSED WATER SERVICE CONNECTION
- PROPOSED FIRE HYDRANT



A TYPICAL IRRIGATION CONNECTION
Scale: NTS

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

ZENOVIC & ASSOCIATES
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EMAIL: ZENOVIC@ZENOVIC.NET

REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY UTILITY PLAN - 1 OF 3

CLIENT:
MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164-P9

JOB NO: 18164

DATE: August 3, 2021

SET: PRE-PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

SHEET
C301

LEGEND: (UNLESS OTHERWISE INDICATED)

- ..... PROPERTY BOUNDARY
- ..... EASEMENT BOUNDARY
- ..... PROPOSED STORM LINE
- ..... PROPOSED WATER LINE
- ..... EXISTING WATER LINE
- ..... PROPOSED GRAVITY SEWER LINE
- ..... PROPOSED SS FORCE MAIN
- ..... EXISTING GRAVITY SEWER LINE
- ..... EXISTING/REALIGNED GRAVITY IRRIGATION LINE
- ..... PROPOSED PRESSURE IRRIGATION LINE
- ..... PROPOSED SANITARY SEWER SERVICE
- SSMH ..... PROPOSED SANITARY SEWER MANHOLE
- (E) SSMH ..... EXISTING SANITARY SEWER MANHOLE
- CB ..... PROPOSED STORM DRAIN CATCH BASIN
- ..... PROPOSED STORM SEWER CONNECTION
- ..... PROPOSED WATER SERVICE CONNECTION
- ..... PROPOSED FIRE HYDRANT

PHASE 2
PHASE 4

WEST SEQUIM BAY RD.

STORMWATER TREATMENT CATCH BASIN

LOT 34 12052 SF±
LOT 35 10929 SF±
LOT 36 11024 SF±
LOT 37 11399 SF±
LOT 38 12731 SF±
LOT 39 12731 SF±
LOT 40 12200 SF±
LOT 41 13085 SF±
LOT 82 11627 SF±
LOT 81 12222 SF±
LOT 80 9712 SF±
LOT 79 8866 SF±
LOT 78 8393 SF±
LOT 77 8494 SF±
LOT 76 10435 SF±
LOT 75 9615 SF±
LOT 74 10396 SF±
LOT 73 9423 SF±
LOT 72 9782 SF±
LOT 71 9900 SF±
LOT 70 9900 SF±
LOT 69 9910 SF±
LOT 33 10898 SF±
LOT 32 11054 SF±
LOT 31 11040 SF±
LOT 30 11028 SF±
LOT 29 9986 SF±
LOT 45 8436 SF±
LOT 44 9318 SF±
LOT 43 9190 SF±
LOT 42 9373 SF±
LOT 46 10456 SF±
LOT 61 11255 SF±
LOT 62 10521 SF±
LOT 63 11016 SF±
LOT 64 11000 SF±
LOT 60 9683 SF±
LOT 47 14213 SF±
OPEN SPACE 9320 SF±

10' IRR ESMNT
20' DRNG ESMNT
2Ø SS FORCE MAIN
EXISTING PUMP STATION SEE PUMP STATION ANALYSIS PREPARED BY THIS OFFICE
CAPTURE OUTFALL FROM EXISTING DETENTION POND
EXISTING STORMWATER DETENTION POND
SSMH-11
SSMH-12
SSMH-13
SSMH-14
SSMH-15
SSMH-16
SSMH-17
SSMH-18
SSMH-21
SSMH-25
(E) SSMH-05
CB

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

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REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III - W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY UTILITY PLAN - 2 OF 3

CLIENT:
MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164-P9

JOB NO: 18164

DATE: August 3, 2021

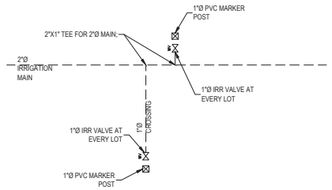
SET: PRE-PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

SHEET
C302

LEGEND: (UNLESS OTHERWISE INDICATED)

- ..... PROPERTY BOUNDARY
- ..... EASEMENT BOUNDARY
- ..... PROPOSED STORM LINE
- ..... PROPOSED WATER LINE
- ..... EXISTING WATER LINE
- ..... PROPOSED GRAVITY SEWER LINE
- ..... PROPOSED SS FORCE MAIN
- ..... EXISTING GRAVITY SEWER LINE
- ..... EXISTING/REALIGNED GRAVITY IRRIGATION LINE
- ..... PROPOSED PRESSURE IRRIGATION LINE
- ..... PROPOSED SANITARY SEWER SERVICE
- SSMH ..... PROPOSED SANITARY SEWER MANHOLE
- (E) SSMH ..... EXISTING SANITARY SEWER MANHOLE
- CB ..... PROPOSED STORM DRAIN CATCH BASIN
- ..... PROPOSED STORM SEWER CONNECTION
- ..... PROPOSED WATER SERVICE CONNECTION
- ..... PROPOSED FIRE HYDRANT



A TYPICAL IRRIGATION CONNECTION
Scale: NTS

SITE PLAN

Scale: 1" = 40'

0 40' 80' 120'

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REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY UTILITY PLAN - 3 OF 3

CLIENT:
MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: 1" = 40'

FILE: 18164–P9

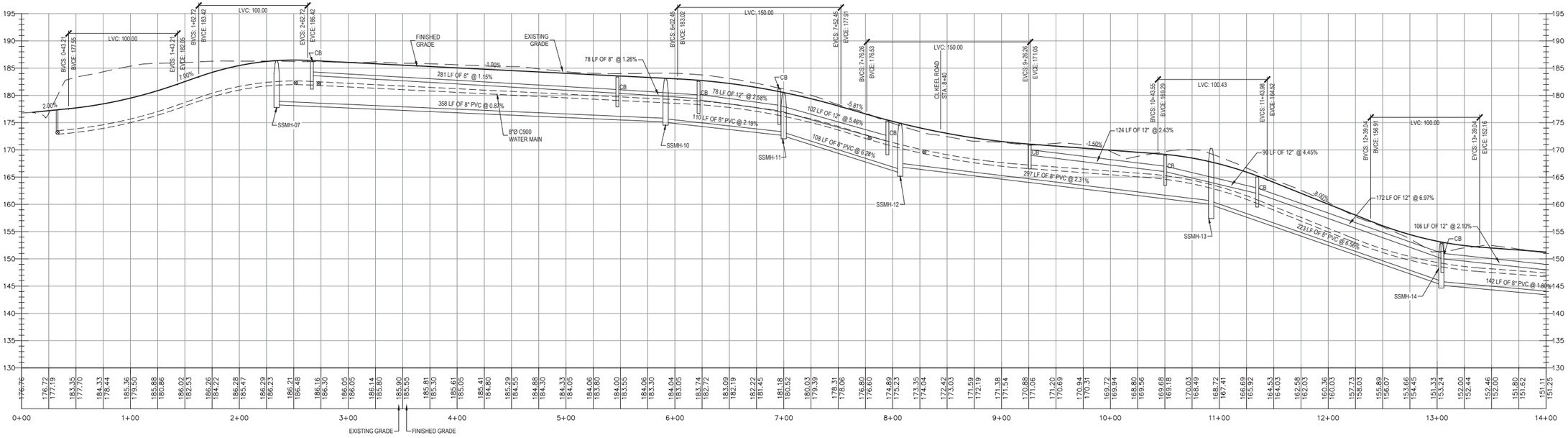
JOB NO: 18164

DATE: August 3, 2021

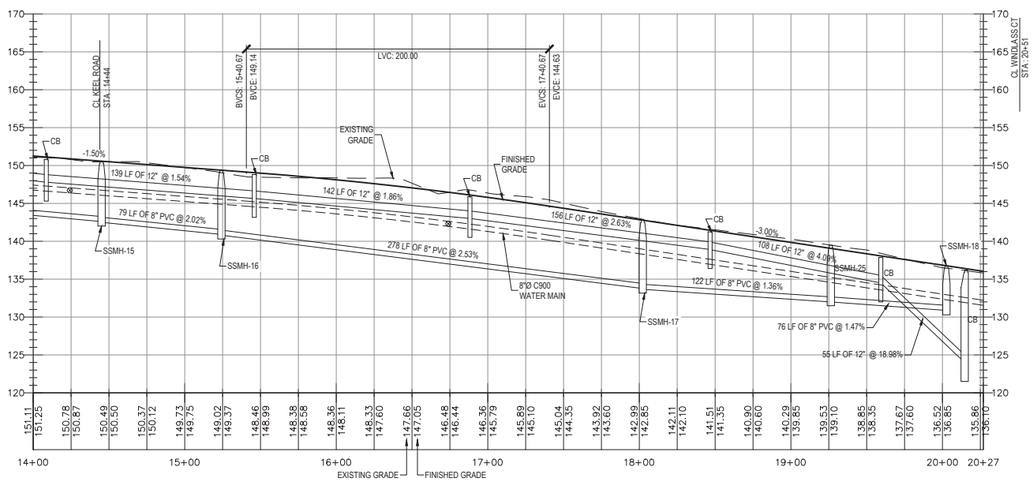
SET: PRE–PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

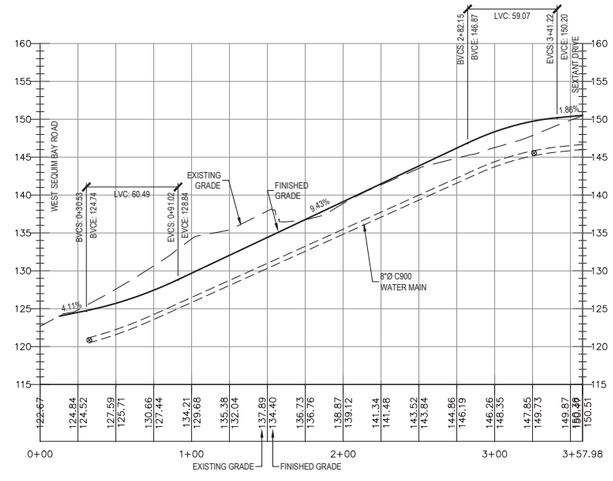
SHEET
C303



CUTTER WAY PROFILE
SCALE: 50
VERT. EXAGERATION: 5.0



CUTTER WAY PROFILE
SCALE: 50
VERT. EXAGERATION: 5.0



KEEL ROAD (1) PROFILE
SCALE: 50
VERT. EXAGERATION: 5.0

ZENOVIC & ASSOCIATES
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PORT ANGELES, WA 98362
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FAX: (360) 417-0514
EMAIL: ZENOVIC@ZENOVIC.NET

REVISIONS:

DATE	MARK	NOTE

PRELIMINARY ROADWAY PROFILES 1 OF 2

TITLE: MARINERS OUTLOOK PHASE III – W. SEQUIM BAY ROAD, SEQUIM, WA

CLIENT: MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: NOTED

FILE: 18164–P9

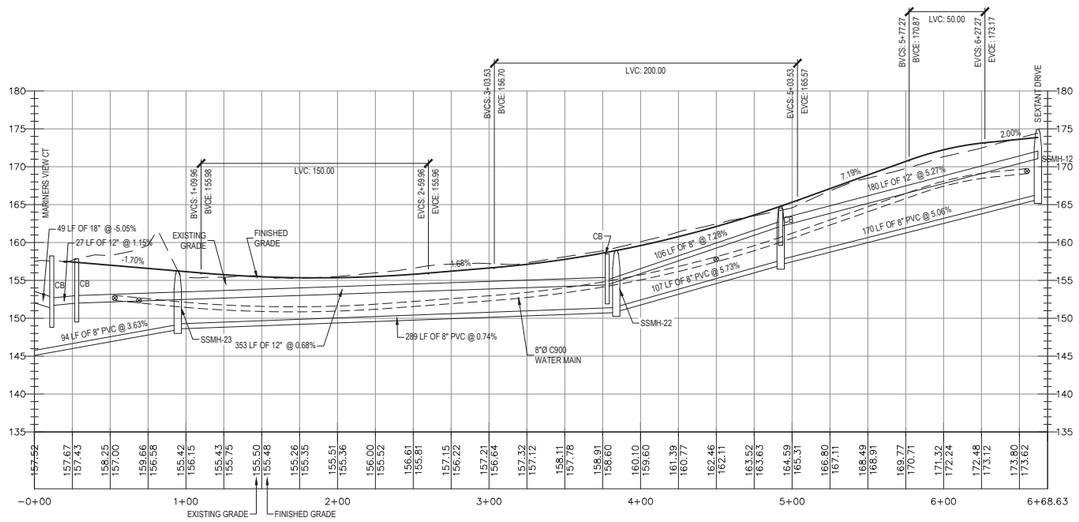
JOB NO: 18164

DATE: August 3, 2021

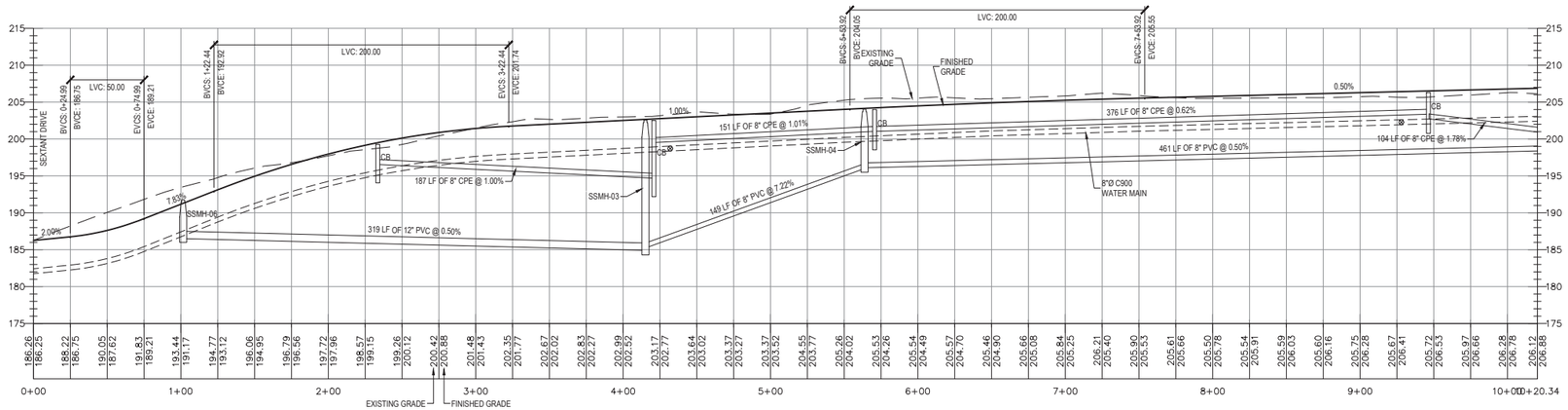
SET: PRE–PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

SHEET
C311



MARINER VIEW DRIVE PROFILE
SCALE: 50
VERT. EXAGERATION: 5.0



ANCHOR LANE PROFILE
SCALE: 50
VERT. EXAGERATION: 5.0

ZENOVIC & ASSOCIATES
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301 E. 6TH STREET, SUITE 1
PORT ANGELES, WA 98362
PHONE: (360) 417-0501
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EMAIL: ZENOVIC@ZENOVIC.NET

REVISIONS:

DATE	MARK	NOTE

TITLE: MARINERS OUTLOOK PHASE III - W. SEQUIM BAY ROAD, SEQUIM, WA

PRELIMINARY ROADWAY PROFILES 2 OF 2

CLIENT:
MARINERS INVESTORS, LTD.
6679 GUNPARK DR. STE. D
BOULDER, CO 80301

SCALE: NOTED

FILE: 18164-P9

JOB NO: 16462

DATE: August 3, 2021

SET: PRE-PLAT

SETH J. RODMAN
STATE OF WASHINGTON
53777
REGISTERED
PROFESSIONAL ENGINEER

SHEET
C312

APPENDIX B

STORMWATER CALCULATIONS

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	18164-P4 (full control)
Site Name:	
Site Address:	
City:	
Report Date:	8/3/2021
Gage:	Port Angelis
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2018/10/10
Version:	4.2.16

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	28.12
Pervious Total	28.12
Impervious Land Use	acre
Impervious Total	0
Basin Total	28.12

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Phases 2-4

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	12.6002
Pervious Total	12.6002

Impervious Land Use	acre
ROADS FLAT	2.4767
ROOF TOPS FLAT	4.6279
DRIVEWAYS MOD	1.3594
SIDEWALKS MOD	0.7888
Impervious Total	9.2528
Basin Total	21.853

Element Flows To:

Surface	Interflow	Groundwater
Pond #2	Pond #2	

Phase 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Mod	3.673
Pervious Total	3.673

Impervious Land Use	acre
ROADS FLAT	0.593
ROOF TOPS FLAT	1.396
DRIVEWAYS MOD	0.523
SIDEWALKS MOD	0.082
Impervious Total	2.594
Basin Total	6.267

Element Flows To:

Surface	Interflow	Groundwater
Pond #1	Pond #1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Pond #2

Bottom Length: 89.02 ft.
Bottom Width: 89.02 ft.
Depth: 6 ft.
Volume at riser head: 1.2505 acre-feet.
Infiltration On
Infiltration rate: 3.5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 906.948
Total Volume Through Riser (ac-ft.): 100.399
Total Volume Through Facility (ac-ft.): 1007.346
Percent Infiltrated: 90.03
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 2.69 in. Elevation:0 ft.
Orifice 2 Diameter: 3.52 in. Elevation:3.335 ft.
Orifice 3 Diameter: 2.23 in. Elevation:4.14708333333337 ft.
Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.181	0.000	0.000	0.000
0.0667	0.183	0.012	0.050	0.642
0.1333	0.185	0.024	0.071	0.642
0.2000	0.186	0.036	0.087	0.642
0.2667	0.188	0.049	0.101	0.642
0.3333	0.190	0.062	0.113	0.642
0.4000	0.191	0.074	0.124	0.642
0.4667	0.193	0.087	0.134	0.642
0.5333	0.195	0.100	0.143	0.642
0.6000	0.196	0.113	0.152	0.642
0.6667	0.198	0.126	0.160	0.642
0.7333	0.200	0.140	0.168	0.642
0.8000	0.202	0.153	0.175	0.642
0.8667	0.203	0.167	0.182	0.642
0.9333	0.205	0.180	0.189	0.642
1.0000	0.207	0.194	0.196	0.642
1.0667	0.209	0.208	0.202	0.642
1.1333	0.210	0.222	0.209	0.642
1.2000	0.212	0.236	0.215	0.642
1.2667	0.214	0.250	0.221	0.642
1.3333	0.216	0.265	0.226	0.642
1.4000	0.217	0.279	0.232	0.642
1.4667	0.219	0.294	0.237	0.642
1.5333	0.221	0.308	0.243	0.642

1.6000	0.223	0.323	0.248	0.642
1.6667	0.225	0.338	0.253	0.642
1.7333	0.226	0.353	0.258	0.642
1.8000	0.228	0.368	0.263	0.642
1.8667	0.230	0.384	0.268	0.642
1.9333	0.232	0.399	0.273	0.642
2.0000	0.234	0.415	0.277	0.642
2.0667	0.236	0.430	0.282	0.642
2.1333	0.238	0.446	0.286	0.642
2.2000	0.239	0.462	0.291	0.642
2.2667	0.241	0.478	0.295	0.642
2.3333	0.243	0.494	0.300	0.642
2.4000	0.245	0.511	0.304	0.642
2.4667	0.247	0.527	0.308	0.642
2.5333	0.249	0.544	0.312	0.642
2.6000	0.251	0.560	0.316	0.642
2.6667	0.253	0.577	0.320	0.642
2.7333	0.255	0.594	0.324	0.642
2.8000	0.257	0.611	0.328	0.642
2.8667	0.259	0.628	0.332	0.642
2.9333	0.260	0.646	0.336	0.642
3.0000	0.262	0.663	0.340	0.642
3.0667	0.264	0.681	0.343	0.642
3.1333	0.266	0.698	0.347	0.642
3.2000	0.268	0.716	0.351	0.642
3.2667	0.270	0.734	0.354	0.642
3.3333	0.272	0.752	0.358	0.642
3.4000	0.274	0.771	0.447	0.642
3.4667	0.276	0.789	0.487	0.642
3.5333	0.278	0.808	0.518	0.642
3.6000	0.280	0.826	0.545	0.642
3.6667	0.282	0.845	0.569	0.642
3.7333	0.285	0.864	0.591	0.642
3.8000	0.287	0.883	0.612	0.642
3.8667	0.289	0.902	0.631	0.642
3.9333	0.291	0.922	0.649	0.642
4.0000	0.293	0.941	0.666	0.642
4.0667	0.295	0.961	0.683	0.642
4.1333	0.297	0.980	0.699	0.642
4.2000	0.299	1.000	0.746	0.642
4.2667	0.301	1.020	0.776	0.642
4.3333	0.303	1.040	0.803	0.642
4.4000	0.305	1.061	0.826	0.642
4.4667	0.307	1.081	0.849	0.642
4.5333	0.310	1.102	0.870	0.642
4.6000	0.312	1.123	0.890	0.642
4.6667	0.314	1.143	0.909	0.642
4.7333	0.316	1.164	0.928	0.642
4.8000	0.318	1.186	0.946	0.642
4.8667	0.320	1.207	0.963	0.642
4.9333	0.323	1.228	0.980	0.642
5.0000	0.325	1.250	0.997	0.642
5.0667	0.327	1.272	1.287	0.642
5.1333	0.329	1.294	1.801	0.642
5.2000	0.331	1.316	2.449	0.642
5.2667	0.334	1.338	3.184	0.642
5.3333	0.336	1.360	3.958	0.642
5.4000	0.338	1.383	4.722	0.642

5.4667	0.340	1.405	5.431	0.642
5.5333	0.342	1.428	6.043	0.642
5.6000	0.345	1.451	6.534	0.642
5.6667	0.347	1.474	6.901	0.642
5.7333	0.349	1.497	7.174	0.642
5.8000	0.351	1.521	7.512	0.642
5.8667	0.354	1.544	7.784	0.642
5.9333	0.356	1.568	8.047	0.642
6.0000	0.358	1.592	8.300	0.642
6.0667	0.361	1.616	8.545	0.642

Pond #1

Bottom Length: 150.00 ft.
Bottom Width: 27.50 ft.
Depth: 4 ft.
Volume at riser head: 0.4055 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 3 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 0.5 in. Elevation:0 ft.
Orifice 2 Diameter: 1.75 in. Elevation:2 ft.
Orifice 3 Diameter: 1.75 in. Elevation:2.75 ft.
Element Flows To:
Outlet 1 Outlet 2
Pond #2

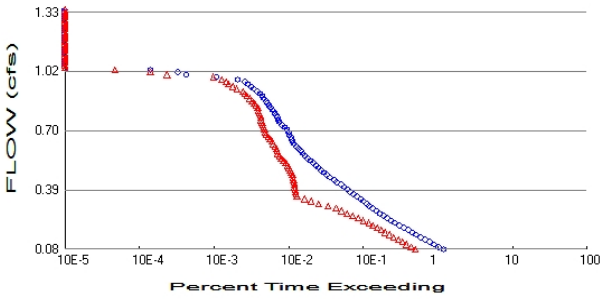
Pond Hydraulic Table

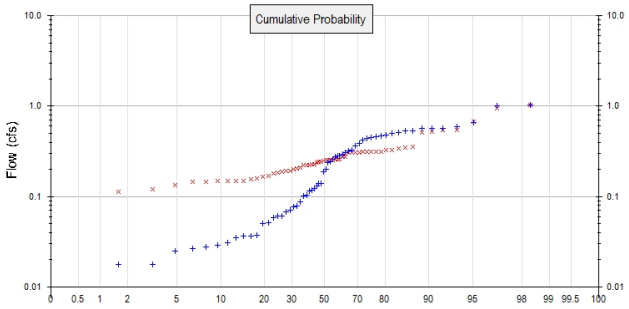
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.094	0.000	0.000	0.000
0.0444	0.095	0.004	0.001	0.000
0.0889	0.096	0.008	0.002	0.000
0.1333	0.098	0.012	0.002	0.000
0.1778	0.099	0.017	0.002	0.000
0.2222	0.100	0.021	0.003	0.000
0.2667	0.101	0.026	0.003	0.000
0.3111	0.102	0.030	0.003	0.000
0.3556	0.103	0.035	0.004	0.000
0.4000	0.104	0.039	0.004	0.000
0.4444	0.105	0.044	0.004	0.000
0.4889	0.106	0.049	0.004	0.000
0.5333	0.108	0.054	0.005	0.000
0.5778	0.109	0.058	0.005	0.000
0.6222	0.110	0.063	0.005	0.000
0.6667	0.111	0.068	0.005	0.000
0.7111	0.112	0.073	0.005	0.000
0.7556	0.113	0.078	0.005	0.000
0.8000	0.114	0.083	0.006	0.000
0.8444	0.115	0.088	0.006	0.000
0.8889	0.117	0.094	0.006	0.000
0.9333	0.118	0.099	0.006	0.000
0.9778	0.119	0.104	0.006	0.000
1.0222	0.120	0.109	0.006	0.000
1.0667	0.121	0.115	0.007	0.000
1.1111	0.122	0.120	0.007	0.000
1.1556	0.124	0.126	0.007	0.000
1.2000	0.125	0.131	0.007	0.000
1.2444	0.126	0.137	0.007	0.000
1.2889	0.127	0.143	0.007	0.000
1.3333	0.128	0.148	0.007	0.000
1.3778	0.130	0.154	0.008	0.000
1.4222	0.131	0.160	0.008	0.000
1.4667	0.132	0.166	0.008	0.000
1.5111	0.133	0.172	0.008	0.000

1.5556	0.134	0.177	0.008	0.000
1.6000	0.135	0.183	0.008	0.000
1.6444	0.137	0.190	0.008	0.000
1.6889	0.138	0.196	0.008	0.000
1.7333	0.139	0.202	0.008	0.000
1.7778	0.140	0.208	0.009	0.000
1.8222	0.142	0.214	0.009	0.000
1.8667	0.143	0.221	0.009	0.000
1.9111	0.144	0.227	0.009	0.000
1.9556	0.145	0.234	0.009	0.000
2.0000	0.146	0.240	0.009	0.000
2.0444	0.148	0.247	0.027	0.000
2.0889	0.149	0.253	0.034	0.000
2.1333	0.150	0.260	0.040	0.000
2.1778	0.151	0.267	0.045	0.000
2.2222	0.153	0.273	0.049	0.000
2.2667	0.154	0.280	0.053	0.000
2.3111	0.155	0.287	0.056	0.000
2.3556	0.156	0.294	0.060	0.000
2.4000	0.158	0.301	0.063	0.000
2.4444	0.159	0.308	0.066	0.000
2.4889	0.160	0.315	0.068	0.000
2.5333	0.161	0.322	0.071	0.000
2.5778	0.163	0.330	0.074	0.000
2.6222	0.164	0.337	0.076	0.000
2.6667	0.165	0.344	0.078	0.000
2.7111	0.167	0.352	0.081	0.000
2.7556	0.168	0.359	0.089	0.000
2.8000	0.169	0.367	0.104	0.000
2.8444	0.170	0.374	0.113	0.000
2.8889	0.172	0.382	0.120	0.000
2.9333	0.173	0.389	0.127	0.000
2.9778	0.174	0.397	0.133	0.000
3.0222	0.176	0.405	0.191	0.000
3.0667	0.177	0.413	0.418	0.000
3.1111	0.178	0.421	0.737	0.000
3.1556	0.180	0.429	1.124	0.000
3.2000	0.181	0.437	1.563	0.000
3.2444	0.182	0.445	2.040	0.000
3.2889	0.184	0.453	2.542	0.000
3.3333	0.185	0.461	3.054	0.000
3.3778	0.186	0.470	3.562	0.000
3.4222	0.188	0.478	4.051	0.000
3.4667	0.189	0.486	4.509	0.000
3.5111	0.190	0.495	4.924	0.000
3.5556	0.192	0.503	5.288	0.000
3.6000	0.193	0.512	5.595	0.000
3.6444	0.194	0.520	5.847	0.000
3.6889	0.196	0.529	6.050	0.000
3.7333	0.197	0.538	6.218	0.000
3.7778	0.198	0.547	6.458	0.000
3.8222	0.200	0.555	6.637	0.000
3.8667	0.201	0.564	6.812	0.000
3.9111	0.203	0.573	6.982	0.000
3.9556	0.204	0.582	7.148	0.000
4.0000	0.205	0.592	7.310	0.000
4.0444	0.207	0.601	7.469	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 28.12
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 16.2732
Total Impervious Area: 11.8468

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.160076
5 year	0.411538
10 year	0.645617
25 year	1.011068
50 year	1.328253
100 year	1.679045

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.239237
5 year	0.365776
10 year	0.467426
25 year	0.618264
50 year	0.748257
100 year	0.894547

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.058	0.526
1950	0.277	0.274
1951	0.201	0.229
1952	0.035	0.113
1953	0.061	0.244
1954	0.573	0.340
1955	0.531	0.509
1956	0.186	0.258
1957	0.325	0.253
1958	0.051	0.187

1959	0.320	0.258
1960	0.480	0.314
1961	0.592	0.678
1962	0.036	0.149
1963	0.119	0.223
1964	0.140	0.251
1965	0.068	0.210
1966	0.061	0.145
1967	0.569	0.356
1968	0.105	0.182
1969	0.036	0.147
1970	0.029	0.203
1971	0.571	0.252
1972	0.660	0.345
1973	0.087	0.259
1974	0.070	0.091
1975	0.115	0.224
1976	0.141	0.223
1977	0.025	0.158
1978	0.018	0.165
1979	0.018	0.543
1980	0.304	0.330
1981	0.240	0.541
1982	0.451	0.248
1983	0.421	0.306
1984	0.078	0.149
1985	0.463	0.311
1986	1.005	1.034
1987	0.367	0.275
1988	0.132	0.254
1989	0.122	0.191
1990	0.235	0.202
1991	0.469	0.312
1992	0.537	0.311
1993	0.031	0.133
1994	0.006	0.155
1995	0.050	0.120
1996	0.257	0.144
1997	0.280	0.309
1998	0.028	0.168
1999	1.036	0.947
2000	0.293	0.228
2001	0.027	0.150
2002	0.384	0.308
2003	0.279	0.180
2004	0.443	0.330
2005	0.037	0.240
2006	0.507	0.315
2007	0.495	0.305
2008	0.077	0.236
2009	0.101	0.191

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.0363	1.0342
2	1.0052	0.9466
3	0.6600	0.6777

4	0.5918	0.5430
5	0.5726	0.5412
6	0.5713	0.5255
7	0.5691	0.5088
8	0.5372	0.3564
9	0.5312	0.3454
10	0.5068	0.3405
11	0.4952	0.3298
12	0.4796	0.3298
13	0.4693	0.3147
14	0.4627	0.3136
15	0.4511	0.3118
16	0.4427	0.3114
17	0.4214	0.3109
18	0.3841	0.3092
19	0.3669	0.3078
20	0.3250	0.3062
21	0.3195	0.3046
22	0.3038	0.2747
23	0.2932	0.2736
24	0.2804	0.2588
25	0.2792	0.2577
26	0.2766	0.2577
27	0.2570	0.2541
28	0.2403	0.2527
29	0.2348	0.2517
30	0.2013	0.2509
31	0.1865	0.2482
32	0.1407	0.2437
33	0.1398	0.2401
34	0.1321	0.2359
35	0.1217	0.2293
36	0.1186	0.2277
37	0.1146	0.2240
38	0.1046	0.2227
39	0.1011	0.2227
40	0.0867	0.2099
41	0.0785	0.2032
42	0.0771	0.2022
43	0.0699	0.1914
44	0.0679	0.1909
45	0.0612	0.1874
46	0.0610	0.1822
47	0.0578	0.1805
48	0.0509	0.1680
49	0.0504	0.1653
50	0.0370	0.1577
51	0.0365	0.1545
52	0.0363	0.1497
53	0.0353	0.1490
54	0.0306	0.1488
55	0.0286	0.1471
56	0.0275	0.1446
57	0.0267	0.1443
58	0.0248	0.1330
59	0.0177	0.1200
60	0.0176	0.1128
61	0.0058	0.0910

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0800	25495	10658	41	Pass
0.0926	21945	9311	42	Pass
0.1053	18758	8081	43	Pass
0.1179	16382	7182	43	Pass
0.1305	14309	6293	43	Pass
0.1431	12472	5446	43	Pass
0.1557	11011	4761	43	Pass
0.1683	9678	4188	43	Pass
0.1809	8534	3724	43	Pass
0.1935	7424	3260	43	Pass
0.2061	6453	2864	44	Pass
0.2187	5715	2535	44	Pass
0.2313	5001	2147	42	Pass
0.2439	4475	1825	40	Pass
0.2566	3989	1523	38	Pass
0.2692	3568	1292	36	Pass
0.2818	3208	1094	34	Pass
0.2944	2866	919	32	Pass
0.3070	2586	715	27	Pass
0.3196	2359	535	22	Pass
0.3322	2150	427	19	Pass
0.3448	1977	352	17	Pass
0.3574	1763	274	15	Pass
0.3700	1571	270	17	Pass
0.3826	1426	264	18	Pass
0.3952	1302	260	19	Pass
0.4079	1186	257	21	Pass
0.4205	1070	255	23	Pass
0.4331	948	250	26	Pass
0.4457	870	249	28	Pass
0.4583	769	243	31	Pass
0.4709	687	241	35	Pass
0.4835	630	233	36	Pass
0.4961	581	224	38	Pass
0.5087	535	215	40	Pass
0.5213	498	205	41	Pass
0.5339	455	195	42	Pass
0.5465	415	183	44	Pass
0.5592	386	169	43	Pass
0.5718	351	160	45	Pass
0.5844	332	152	45	Pass
0.5970	311	149	47	Pass
0.6096	290	146	50	Pass
0.6222	271	140	51	Pass
0.6348	255	134	52	Pass
0.6474	241	128	53	Pass
0.6600	231	120	51	Pass
0.6726	226	114	50	Pass
0.6852	217	106	48	Pass
0.6978	211	103	48	Pass
0.7104	203	101	49	Pass
0.7231	188	99	52	Pass
0.7357	173	95	54	Pass

0.7483	162	94	58	Pass
0.7609	156	91	58	Pass
0.7735	150	90	60	Pass
0.7861	146	89	60	Pass
0.7987	138	86	62	Pass
0.8113	130	83	63	Pass
0.8239	121	82	67	Pass
0.8365	116	78	67	Pass
0.8491	111	74	66	Pass
0.8617	107	69	64	Pass
0.8744	99	64	64	Pass
0.8870	94	59	62	Pass
0.8996	88	55	62	Pass
0.9122	80	52	65	Pass
0.9248	73	43	58	Pass
0.9374	67	38	56	Pass
0.9500	60	33	55	Pass
0.9626	55	31	56	Pass
0.9752	44	27	61	Pass
0.9878	23	21	91	Pass
1.0004	9	5	55	Pass
1.0130	7	3	42	Pass
1.0257	3	1	33	Pass
1.0383	0	0	33	Pass
1.0509	0	0	0	Pass
1.0635	0	0	0	Pass
1.0761	0	0	0	Pass
1.0887	0	0	0	Pass
1.1013	0	0	0	Pass
1.1139	0	0	0	Pass
1.1265	0	0	0	Pass
1.1391	0	0	0	Pass
1.1517	0	0	0	Pass
1.1643	0	0	0	Pass
1.1770	0	0	0	Pass
1.1896	0	0	0	Pass
1.2022	0	0	0	Pass
1.2148	0	0	0	Pass
1.2274	0	0	0	Pass
1.2400	0	0	0	Pass
1.2526	0	0	0	Pass
1.2652	0	0	0	Pass
1.2778	0	0	0	Pass
1.2904	0	0	0	Pass
1.3030	0	0	0	Pass
1.3156	0	0	0	Pass
1.3283	0	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Pond #2 POC	☐	916.69			☐	90.03			
Pond #1	☐	201.68			☐	0.00			
Total Volume Infiltrated		1118.37	0.00	0.00		73.80	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

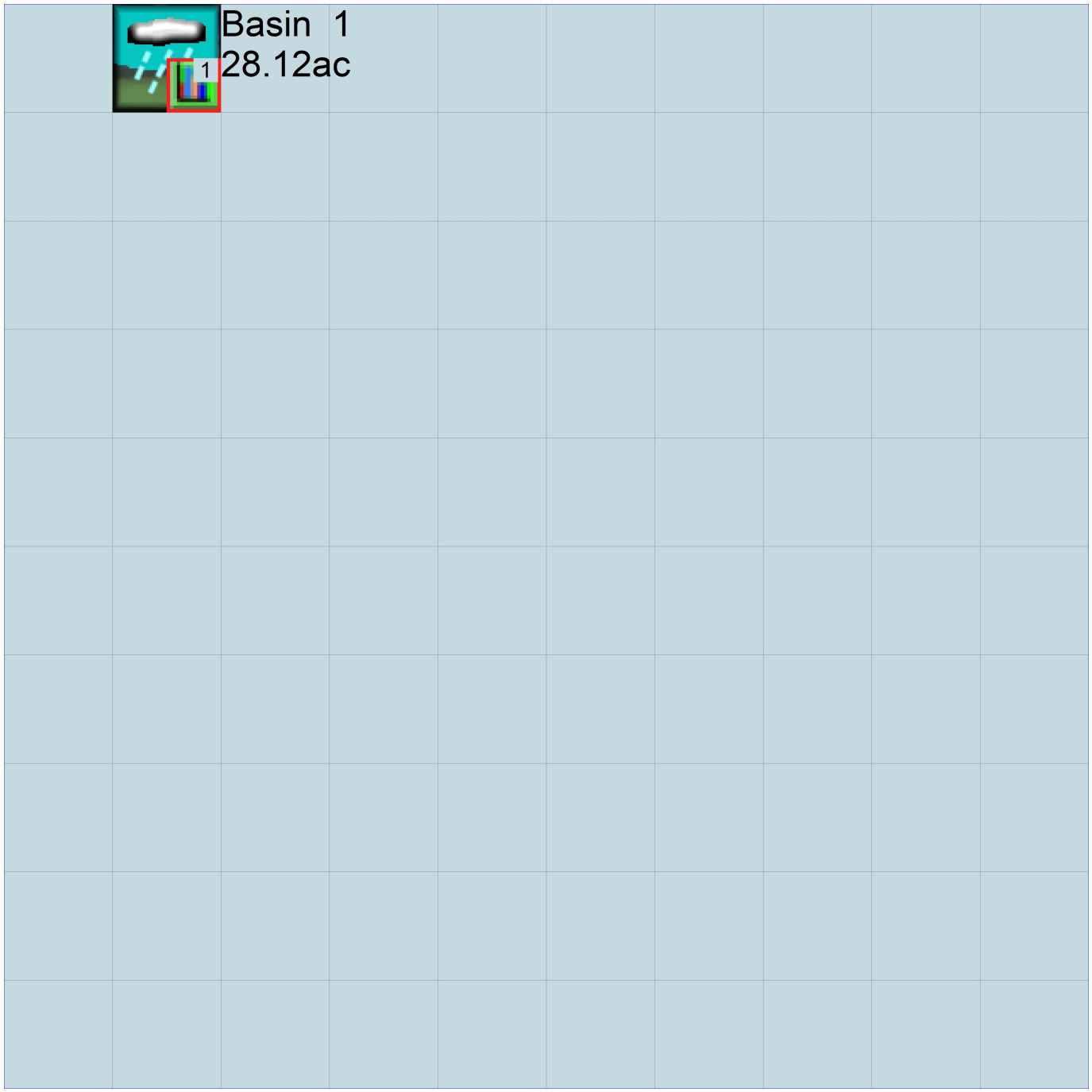
No PERLND changes have been made.

IMPLND Changes

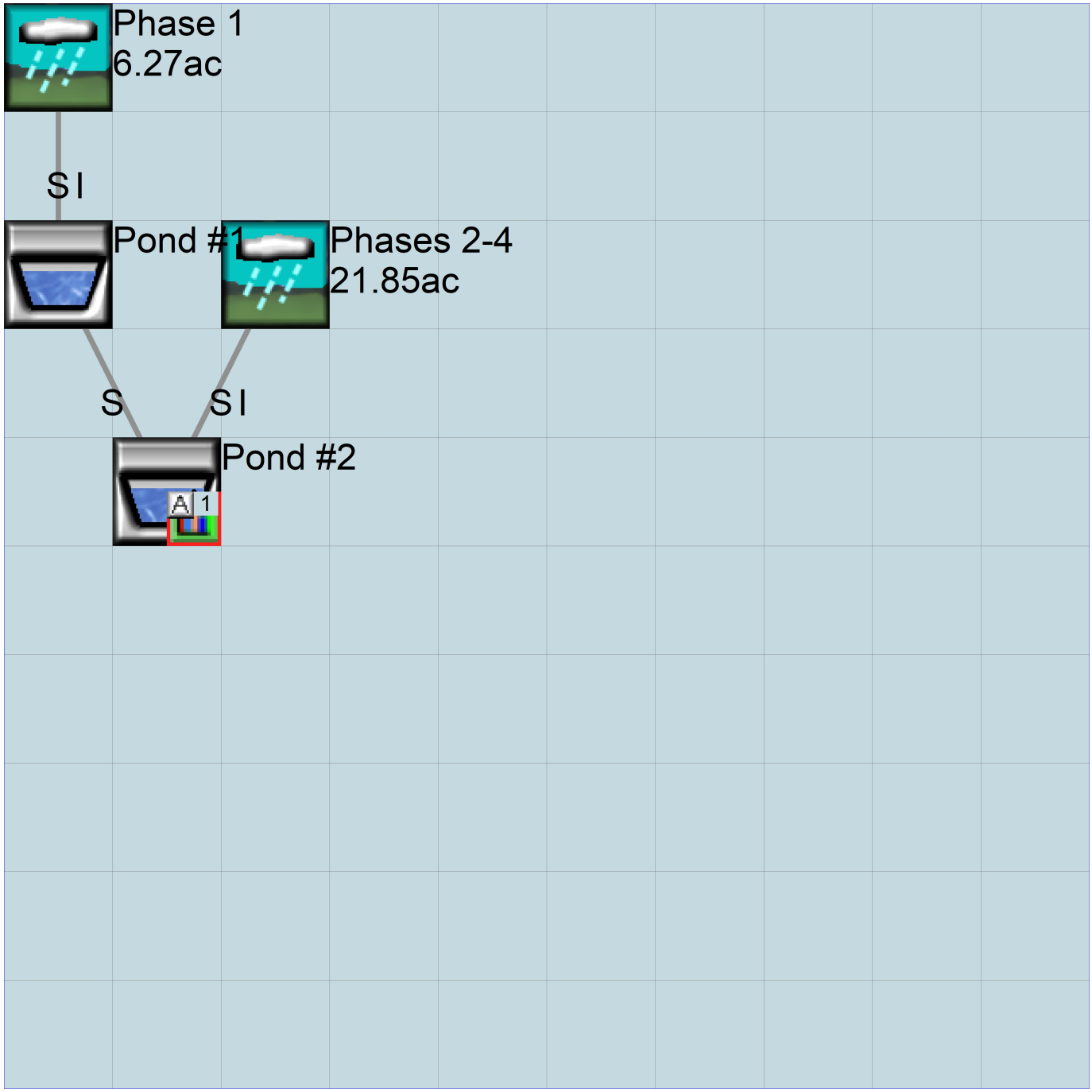
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

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RUN

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  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

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WDM         26   18164-P4 (full control).wdm
MESSU       25   Pre18164-P4 (full control).MES
            27   Pre18164-P4 (full control).L61
            28   Pre18164-P4 (full control).L62
            30   POC18164-P4 (full control)1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   11     C, Forest, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11           0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  11                       28.12     COPY   501     12
PERLND  11                       28.12     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   18164-P4 (full control).wdm
MESSU       25   Mit18164-P4 (full control).MES
            27   Mit18164-P4 (full control).L61
            28   Mit18164-P4 (full control).L62
            30   POC18164-P4 (full control)1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      14
      IMPLND       1
      IMPLND       4
      IMPLND       6
      IMPLND       9
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pond #2                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   14         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   14         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   14         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   14           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   14              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    6      DRIVEWAYS/MOD          1    1    1   27    0
    9      SIDEWALKS/MOD          1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    6         0    0    1    0    0    0
    9         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    6         0    0    4    0    0    0    1    9
    9         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
```

```
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
    6         0    0    0    0    0
    9         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
    6            400      0.05       0.1      0.08
    9            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
    6              0         0
    9              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    6              0         0
    9              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Phases 2-4***
PERLND  14                    12.6002     RCHRES   2      2
PERLND  14                    12.6002     RCHRES   2      3
IMPLND   1                     2.4767     RCHRES   2      5
IMPLND   4                     4.6279     RCHRES   2      5
IMPLND   6                     1.3594     RCHRES   2      5
IMPLND   9                     0.7888     RCHRES   2      5
Phase 1***
PERLND  14                      3.673     RCHRES   1      2
PERLND  14                      3.673     RCHRES   1      3
IMPLND   1                      0.593     RCHRES   1      5
IMPLND   4                      1.396     RCHRES   1      5
IMPLND   6                      0.523     RCHRES   1      5
IMPLND   9                      0.082     RCHRES   1      5

******Routing******
PERLND  14                    12.6002     COPY     1     12
IMPLND   1                     2.4767     COPY     1     15
IMPLND   4                     4.6279     COPY     1     15
IMPLND   6                     1.3594     COPY     1     15
IMPLND   9                     0.7888     COPY     1     15
PERLND  14                    12.6002     COPY     1     13
RCHRES   1                          1     RCHRES   2      6
RCHRES   1                                COPY     1     16
RCHRES   2                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
```

```
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                            ***
    1     Pond #1                1    1    1    1   28    0    1
    2     Pond #2                2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->      ***
    1              1      0.03       0.0       0.0       0.5       0.0
    2              2      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.181905  0.000000  0.000000  0.000000
  0.066667  0.183543  0.012182  0.050701  0.641972
  0.133333  0.185189  0.024473  0.071702  0.641972
  0.200000  0.186842  0.036874  0.087817  0.641972
  0.266667  0.188503  0.049385  0.101402  0.641972
  0.333333  0.190171  0.062008  0.113371  0.641972
```

0.400000	0.191846	0.074742	0.124192	0.641972
0.466667	0.193528	0.087587	0.134143	0.641972
0.533333	0.195218	0.100546	0.143404	0.641972
0.600000	0.196916	0.113617	0.152103	0.641972
0.666667	0.198620	0.126801	0.160331	0.641972
0.733333	0.200332	0.140100	0.168157	0.641972
0.800000	0.202051	0.153512	0.175634	0.641972
0.866667	0.203778	0.167040	0.182806	0.641972
0.933333	0.205512	0.180683	0.189706	0.641972
1.000000	0.207253	0.194442	0.196365	0.641972
1.066667	0.209002	0.208317	0.202805	0.641972
1.133333	0.210758	0.222309	0.209046	0.641972
1.200000	0.212521	0.236418	0.215107	0.641972
1.266667	0.214292	0.250646	0.221001	0.641972
1.333333	0.216070	0.264991	0.226742	0.641972
1.400000	0.217856	0.279455	0.232342	0.641972
1.466667	0.219648	0.294039	0.237809	0.641972
1.533333	0.221448	0.308742	0.243154	0.641972
1.600000	0.223256	0.323565	0.248384	0.641972
1.666667	0.225071	0.338510	0.253506	0.641972
1.733333	0.226893	0.353575	0.258526	0.641972
1.800000	0.228722	0.368762	0.263451	0.641972
1.866667	0.230559	0.384072	0.268285	0.641972
1.933333	0.232403	0.399504	0.273034	0.641972
2.000000	0.234255	0.415059	0.277702	0.641972
2.066667	0.236114	0.430738	0.282292	0.641972
2.133333	0.237980	0.446541	0.286809	0.641972
2.200000	0.239854	0.462469	0.291256	0.641972
2.266667	0.241734	0.478522	0.295636	0.641972
2.333333	0.243623	0.494700	0.299952	0.641972
2.400000	0.245518	0.511005	0.304207	0.641972
2.466667	0.247421	0.527436	0.308403	0.641972
2.533333	0.249332	0.543995	0.312543	0.641972
2.600000	0.251249	0.560681	0.316628	0.641972
2.666667	0.253174	0.577495	0.320662	0.641972
2.733333	0.255107	0.594438	0.324646	0.641972
2.800000	0.257046	0.611509	0.328581	0.641972
2.866667	0.258993	0.628711	0.332470	0.641972
2.933333	0.260948	0.646042	0.336313	0.641972
3.000000	0.262909	0.663504	0.340114	0.641972
3.066667	0.264878	0.681097	0.343872	0.641972
3.133333	0.266855	0.698821	0.347589	0.641972
3.200000	0.268839	0.716678	0.351268	0.641972
3.266667	0.270830	0.734667	0.354908	0.641972
3.333333	0.272828	0.752789	0.358511	0.641972
3.400000	0.274834	0.771044	0.447802	0.641972
3.466667	0.276847	0.789433	0.487617	0.641972
3.533333	0.278868	0.807957	0.518851	0.641972
3.600000	0.280895	0.826616	0.545664	0.641972
3.666667	0.282931	0.845410	0.569650	0.641972
3.733333	0.284973	0.864340	0.591623	0.641972
3.800000	0.287023	0.883407	0.612067	0.641972
3.866667	0.289080	0.902610	0.631296	0.641972
3.933333	0.291145	0.921951	0.649528	0.641972
4.000000	0.293217	0.941430	0.666921	0.641972
4.066667	0.295296	0.961047	0.683596	0.641972
4.133333	0.297382	0.980803	0.699646	0.641972
4.200000	0.299476	1.000698	0.746188	0.641972
4.266667	0.301578	1.020733	0.776820	0.641972
4.333333	0.303686	1.040909	0.802961	0.641972
4.400000	0.305802	1.061225	0.826756	0.641972
4.466667	0.307926	1.081683	0.848983	0.641972
4.533333	0.310056	1.102282	0.870034	0.641972
4.600000	0.312194	1.123024	0.890146	0.641972
4.666667	0.314340	1.143908	0.909479	0.641972
4.733333	0.316492	1.164936	0.928144	0.641972
4.800000	0.318653	1.186107	0.946227	0.641972
4.866667	0.320820	1.207423	0.963792	0.641972
4.933333	0.322995	1.228884	0.980894	0.641972
5.000000	0.325177	1.250489	0.997576	0.641972

```
5.066667  0.327366  1.272241  1.287569  0.641972
5.133333  0.329563  1.294138  1.801282  0.641972
5.200000  0.331767  1.316183  2.449898  0.641972
5.266667  0.333979  1.338374  3.184570  0.641972
5.333333  0.336198  1.360713  3.958295  0.641972
5.400000  0.338424  1.383201  4.722739  0.641972
5.466667  0.340657  1.405837  5.431077  0.641972
5.533333  0.342898  1.428622  6.043523  0.641972
5.600000  0.345146  1.451557  6.534599  0.641972
5.666667  0.347402  1.474642  6.901714  0.641972
5.733333  0.349665  1.497877  7.174849  0.641972
5.800000  0.351935  1.521264  7.512816  0.641972
5.866667  0.354213  1.544802  7.784901  0.641972
5.933333  0.356498  1.568493  8.047035  0.641972
6.000000  0.358790  1.592336  8.300255  0.641972
END FTABLE  2
FTABLE      1
 91    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.094697  0.000000  0.000000
0.044444  0.095785  0.004233  0.001430
0.088889  0.096877  0.008514  0.002023
0.133333  0.097972  0.012844  0.002477
0.177778  0.099070  0.017223  0.002860
0.222222  0.100171  0.021651  0.003198
0.266667  0.101275  0.026127  0.003503
0.311111  0.102383  0.030653  0.003784
0.355556  0.103494  0.035228  0.004045
0.400000  0.104609  0.039852  0.004291
0.444444  0.105726  0.044527  0.004523
0.488889  0.106847  0.049250  0.004744
0.533333  0.107972  0.054024  0.004954
0.577778  0.109099  0.058848  0.005157
0.622222  0.110230  0.063722  0.005351
0.666667  0.111364  0.068646  0.005539
0.711111  0.112501  0.073621  0.005721
0.755556  0.113641  0.078646  0.005897
0.800000  0.114785  0.083723  0.006068
0.844444  0.115932  0.088850  0.006234
0.888889  0.117082  0.094028  0.006396
0.933333  0.118236  0.099257  0.006554
0.977778  0.119393  0.104538  0.006708
1.022222  0.120553  0.109870  0.006859
1.066667  0.121716  0.115254  0.007007
1.111111  0.122883  0.120689  0.007151
1.155556  0.124053  0.126177  0.007293
1.200000  0.125226  0.131716  0.007432
1.244444  0.126402  0.137308  0.007568
1.288889  0.127582  0.142952  0.007702
1.333333  0.128765  0.148648  0.007834
1.377778  0.129951  0.154398  0.007963
1.422222  0.131141  0.160200  0.008091
1.466667  0.132333  0.166055  0.008216
1.511111  0.133529  0.171963  0.008340
1.555556  0.134729  0.177924  0.008461
1.600000  0.135931  0.183939  0.008581
1.644444  0.137137  0.190007  0.008700
1.688889  0.138346  0.196129  0.008817
1.733333  0.139558  0.202304  0.008932
1.777778  0.140774  0.208534  0.009046
1.822222  0.141993  0.214818  0.009158
1.866667  0.143215  0.221156  0.009269
1.911111  0.144440  0.227548  0.009379
1.955556  0.145669  0.233995  0.009487
2.000000  0.146901  0.240496  0.009594
2.044444  0.148136  0.247053  0.027221
2.088889  0.149374  0.253664  0.034583
2.133333  0.150616  0.260331  0.040255
2.177778  0.151861  0.267052  0.045052
```

```
  2.222222  0.153109  0.273829  0.049290
  2.266667  0.154361  0.280662  0.053130
  2.311111  0.155616  0.287550  0.056668
  2.355556  0.156874  0.294495  0.059967
  2.400000  0.158135  0.301495  0.063071
  2.444444  0.159400  0.308551  0.066011
  2.488889  0.160667  0.315664  0.068811
  2.533333  0.161938  0.322833  0.071490
  2.577778  0.163213  0.330058  0.074063
  2.622222  0.164490  0.337341  0.076541
  2.666667  0.165771  0.344680  0.078935
  2.711111  0.167056  0.352076  0.081252
  2.755556  0.168343  0.359529  0.089694
  2.800000  0.169634  0.367040  0.104268
  2.844444  0.170928  0.374608  0.113352
  2.888889  0.172225  0.382234  0.120856
  2.933333  0.173525  0.389917  0.127492
  2.977778  0.174829  0.397658  0.133548
  3.022222  0.176136  0.405457  0.191917
  3.066667  0.177446  0.413315  0.418174
  3.111111  0.178760  0.421230  0.737314
  3.155556  0.180077  0.429204  1.124313
  3.200000  0.181397  0.437237  1.563388
  3.244444  0.182720  0.445329  2.040677
  3.288889  0.184047  0.453479  2.542385
  3.333333  0.185376  0.461688  3.054342
  3.377778  0.186710  0.469957  3.562149
  3.422222  0.188046  0.478285  4.051655
  3.466667  0.189386  0.486672  4.509660
  3.511111  0.190729  0.495119  4.924768
  3.555556  0.192075  0.503626  5.288388
  3.600000  0.193424  0.512193  5.595835
  3.644444  0.194777  0.520819  5.847541
  3.688889  0.196133  0.529506  6.050355
  3.733333  0.197492  0.538254  6.218923
  3.777778  0.198855  0.547061  6.458101
  3.822222  0.200220  0.555930  6.637444
  3.866667  0.201590  0.564859  6.812035
  3.911111  0.202962  0.573849  6.982233
  3.955556  0.204337  0.582900  7.148355
  4.000000  0.205716  0.592012  7.310682
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1003 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>           <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
```

```
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1951/ 7/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-4.112E-03     0.00000  0.0000E+00     0.00000  -1.591E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
DATE/TIME: 1971/ 7/31 24: 0

RCHRES :    1

RELERR       STORS        STOR       MATIN      MATDIF
-1.165E-03     0.00000  0.0000E+00     0.00000  -5.631E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

```
ERROR/WARNING ID:   238   1

The continuity error reported below is greater than 1 part in 1000 and is
therefore considered high.

Did you specify any "special actions"?  If so, they could account for it.

Relevant data are:
```

DATE/TIME: 1974/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-1.204E-03	0.00000	0.0000E+00	0.00000	-5.546E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1980/ 8/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-1.060E-02	0.00000	0.0000E+00	0.00000	-6.225E-09

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 2001/ 7/31 24: 0

RCHRES :   1

RELERR	STORS	STOR	MATIN	MATDIF
-6.458E-03	0.00000	0.0000E+00	0.00000	-1.025E-08

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.

REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.

Disclaimer

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APPENDIX C

SOURCE CONTROL BMPs

S411 BMPs for Landscaping and Lawn/ Vegetation Management

Description of Pollutant Sources: Landscaping can include grading, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Stormwater contaminants include toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests with pesticides. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks, and residential lawn/plant care. It is possible to

release toxic pesticides such as pentachlorophenol, carbamates, and organometallics to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation and poor application of pesticides or fertilizers can cause appreciable stormwater contamination.

Pollutant Control Approach: Control of fertilizer and pesticide applications, soil erosion, and site debris to prevent contamination of stormwater.

Develop and implement an Integrated Pest Management Plan (IPM) and use pesticides only as a last resort. Carefully apply pesticides/ herbicides, in accordance with label instructions. Maintain appropriate vegetation, with proper fertilizer application where practicable, to control erosion and the discharge of stormwater pollutants. Where practicable grow plant species appropriate for the site, or adjust the soil properties of the subject site to grow desired plant species.

Applicable Operational BMPs for Landscaping:

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Do not dispose of collected vegetation into waterways or storm sewer systems.

Recommended Additional Operational BMPs for Landscaping:

- Conduct mulch-mowing whenever practicable
- Dispose of grass clippings, leaves, sticks, or other collected vegetation, by composting, if feasible.
- Use mulch or other erosion control measures on soils exposed for more than one week during the dry season or two days during the rainy season.
- Store and maintain appropriate oil and chemical spill cleanup materials in readily accessible locations when using oil or other chemicals. Ensure that employees are familiar with proper spill cleanup procedures.
- Till fertilizers into the soil rather than dumping or broadcasting onto the surface. Determine the proper fertilizer application rate for the types of soil and vegetation encountered.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and drought-resistant plants.
- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

Applicable Operational BMPs for the Use of Pesticides:

- Develop and implement an IPM (See section on IPM in *Applicable Operational BMPs for Vegetation Management*) and use pesticides only as a last resort.
- Implement a pesticide-use plan and include at a minimum: a list of selected pesticides and their specific uses; brands, formulations, application methods and quantities to be used; equipment use and maintenance procedures; safety, storage, and disposal methods; and monitoring, record keeping, and public notice procedures. All procedures shall conform to the requirements of Chapter 17.21 RCW and Chapter 16-228 WAC (Appendix IV-D R.7).
- Choose the least toxic pesticide available that is capable of reducing the infestation to acceptable levels. The pesticide should readily degrade in the environment and/or have properties that strongly bind it to the soil. Conduct any pest control activity at the life stage when the pest is most vulnerable. For example, if it is necessary to use a Bacillus thuringiens application to control tent caterpillars, apply it to the material before the caterpillars cocoon or it will be ineffective. Any method used should be site-specific and not used wholesale over a wide area.
- Apply the pesticide according to label directions. Do not apply pesticides in quantities that exceed manufacturer's instructions.
- Mix the pesticides and clean the application equipment in an area where accidental spills will not enter surface or ground waters, and will not contaminate the soil.
- Store pesticides in enclosed areas or in covered impervious containment. Do not discharge pesticide contaminated stormwater or spills/leaks of pesticides to storm sewers. Do not hose down the paved areas to a storm sewer or conveyance ditch. Store and maintain appropriate spill cleanup materials in a location known to all near the storage area.
- Clean up any spilled pesticides. Keep pesticide contaminated waste materials in designated covered and contained areas.
- The pesticide application equipment must be capable of immediate shutoff in the event of an emergency.
- Spraying pesticides within 100 feet of open waters including wetlands, ponds, and rivers, streams, creeks, sloughs and any drainage ditch or channel that leads to open water may have additional regulatory requirements beyond just following the pesticide product label. Additional requirements may include:
    - Obtaining a discharge permit from Ecology.
    - Obtaining a permit from the local jurisdiction.
    - Using an aquatic labeled pesticide.

- Flag all sensitive areas including wells, creeks, and wetlands prior to spraying.
- Post notices and delineate the spray area prior to the application, as required by the local jurisdiction or by Ecology.
- Conduct spray applications during weather conditions as specified in the label direction and applicable local and state regulations. Do not apply during rain or immediately before expected rain.

Recommended Additional Operational BMPs for the use of pesticides:

- Consider alternatives to the use of pesticides such as covering or harvesting weeds, substitute vegetative growth, and manual weed control/moss removal.
- Consider the use of soil amendments, such as compost, that are known to control some common diseases in plants, such as Pythium root rot, ashy stem blight, and parasitic nematodes. The following are three possible mechanisms for disease control by compost addition (USEPA Publication 530-F-9-044):
    1. Successful competition for nutrients by antibiotic production;
    2. Successful predation against pathogens by beneficial microorganism; and
    3. Activation of disease-resistant genes in plants by composts.

Installing an amended soil/landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil/landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.

- Once a pesticide is applied, evaluate its effectiveness for possible improvement. Records should be kept showing the effectiveness of the pesticides considered.
- Develop an annual evaluation procedure including a review of the effectiveness of pesticide applications, impact on buffers and sensitive areas (including potable wells), public concerns, and recent toxicological information on pesticides used/proposed for use. If individual or public potable wells are located in the proximity of commercial pesticide applications, contact the regional Ecology hydrogeologist to determine if additional pesticide application control measures are necessary.
- Rinseate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.

For more information, contact the Washington State University (WSU) Extension Home-Assist Program, (253) 445-4556, or Bio-Integral Resource Center (BIRC), P.O. Box 7414, Berkeley, CA.94707, or EPA to

obtain a publication entitled "Suspended, Canceled, and Restricted Pesticides" which lists all restricted pesticides and the specific uses that are allowed.

Applicable Operational BMPs for Vegetation Management:

- Use at least an eight-inch "topsoil" layer with at least 8 percent organic matter to provide a sufficient vegetation-growing medium. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can substantially improve the permeability of the soil, the disease and drought resistance of the vegetation, and reduce fertilizer demand. This reduces the demand for fertilizers, herbicides, and pesticides. Organic matter is the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant growth cycle. Return natural plant debris and mulch to the soil, to continue recycling nutrients indefinitely.
- Select the appropriate turfgrass mixture for the climate and soil type. Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects. However, they do not, repel root-feeding lawn pests such as Crane Fly larvae, and are toxic to ruminants such as cattle and sheep. The fungus causes no known adverse effects to the host plant or to humans. Endophytic grasses are commercially available; use them in areas such as parks or golf courses where grazing does not occur. Local agricultural or gardening resources such as Washington State University Extension office can offer advice on which types of grass are best suited to the area and soil type.
- Use the following seeding and planting BMPs, or equivalent BMPs to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: *Temporary and Permanent Seeding*, *Mulching*, *Plastic Covering*, and *Sodding* as described in Volume II.
- Adjusting the soil properties of the subject site can assist in selection of desired plant species. For example, design a constructed wetland to resist the invasion of reed canary grass by layering specific strata of organic matters (e.g., composted forest product residuals) and creating a mildly acidic pH and carbon-rich soil medium. Consult a soil restoration specialist for site-specific conditions.
- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Conduct aeration while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than ¾-inch deep.

- Mowing is a stress-creating activity for turfgrass. Grass decreases its productivity when mown too short and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers, and irrigation to remain healthy. Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only 1/3 of the grass blade height will prevent stressing the turf.

Irrigation:

- The depth from which a plant normally extracts water depends on the rooting depth of the plant. Appropriately irrigated lawn grasses normally root in the top 6 to 12 inches of soil; lawns irrigated on a daily basis often root only in the top 1 inch of soil. Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering. The amount of water applied depends on the normal rooting depth of the turfgrass species used, the available water holding capacity of the soil, and the efficiency of the irrigation system. Consult with the local water utility, Conservation District, or Cooperative Extension office to help determine optimum irrigation practices.

Fertilizer Management:

- Turfgrass is most responsive to nitrogen fertilization, followed by potassium and phosphorus. Fertilization needs vary by site depending on plant, soil, and climatic conditions. Evaluation of soil nutrient levels through regular testing ensures the best possible efficiency and economy of fertilization. For details on soils testing, contact the local Conservation District, a soils testing professional, or a Washington State University Extension office.
- Apply fertilizers in amounts appropriate for the target vegetation and at the time of year that minimizes losses to surface and ground waters. Do not fertilize when the soil is dry. Alternatively, do not apply fertilizers within three days prior to predicted rainfall. The longer the period between fertilizer application and either rainfall or irrigation, the less fertilizer runoff occurs.
- Use slow release fertilizers such as methylene urea, IDBU, or resin coated fertilizers when appropriate, generally in the spring. Use of slow release fertilizers is especially important in areas with sandy or gravelly soils.
- Time the fertilizer application to periods of maximum plant uptake. Ecology generally recommends application in the fall and spring, although Washington State University turf specialists recommend four fertilizer applications per year.

- Properly trained persons should apply all fertilizers. Apply no fertilizer at commercial and industrial facilities, to grass swales, filter strips, or buffer areas that drain to sensitive water bodies unless approved by the local jurisdiction.

Integrated Pest Management

An IPM program might consist of the following steps:

Step 1: Correctly identify problem pests and understand their life cycle

Step 2: Establish tolerance thresholds for pests.

Step 3: Monitor to detect and prevent pest problems.

Step 4: Modify the maintenance program to promote healthy plants and discourage pests.

Step 5: Use cultural, physical, mechanical or biological controls first if pests exceed the tolerance thresholds.

Step 6: Evaluate and record the effectiveness of the control and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

For an elaboration of these steps, refer to Appendix IV-F.

S414 BMPs for Maintenance and Repair of Vehicles and Equipment

Description of Pollutant Sources: Pollutant sources include parts/vehicle cleaning, spills/leaks of fuel and other liquids, replacement of liquids, outdoor storage of batteries/liquids/parts, and vehicle parking.

Pollutant Control Approach: Control of leaks and spills of fluids using good housekeeping and cover and containment BMPs.

Applicable Operational BMPs:

- Inspect all incoming vehicles, parts, and equipment stored temporarily outside for leaks.
- Use drip pans or containers under parts or vehicles that drip or that are likely to drip liquids, such as during dismantling of liquid containing parts or removal or transfer of liquids.
- Remove batteries and liquids from vehicles and equipment in designated areas designed to prevent stormwater contamination. Store cracked batteries in a covered non-leaking secondary containment system.
- Remove liquids from vehicles retired for scrap.
- Empty oil and fuel filters before disposal. Provide for proper disposal of waste oil and fuel.
- Do not pour/convey washwater, liquid waste, or other pollutants into storm drains or to surface water. Check with the local sanitary sewer authority for approval to convey water to a sanitary sewer.
- Do not connect maintenance and repair shop floor drains to storm drains or to surface water.
- To allow for snowmelt during the winter, install a drainage trench with a sump for particulate collection. Use the drainage trench for draining the snowmelt only and not for discharging any vehicular or shop pollutants.

Applicable Structural Source Control BMPs:

- Conduct all maintenance and repair of vehicles and equipment in a building, or other covered impervious containment area that is sloped to prevent run-on of uncontaminated stormwater and runoff of contaminated water.
- Operators may conduct maintenance of refrigeration engines in refrigerated trailers in the parking area. Exercise due caution to avoid the release of engine or refrigeration fluids to storm drains or surface water.
- Park large mobile equipment, such as log stackers, in a designated contained area.

Additional applicable BMPs:

- S409 BMPs for Fueling at Dedicated Stations
- S410 BMPs for Illicit Connections to Storm Drains
- S412 BMPs for Loading and Unloading Areas for Liquid or Solid Material
- S426 BMPs for Spills of Oil and Hazardous Substances
- S427 BMPs Storage of Liquid, Food Waste, or Dangerous Waste Containers
- S428 BMPs for Storage of Liquids in Permanent Aboveground Tanks
- S429 BMPs for Storage or Transfer (Outside) of Solid Raw Materials, By-Products, or Finished Products
- S431 BMPs for Washing and Steam Cleaning Vehicle/Equipment/Building Structures

Note this applicable treatment BMP for contaminated stormwater.

Applicable Treatment BMPs: Convey contaminated stormwater runoff from vehicle staging and maintenance areas to a sanitary sewer, if allowed by the local sewer authority, or to an API or CP oil and water separator followed by a basic treatment BMP (See Volume V), applicable filter, or other equivalent oil treatment system.

Recommended Additional Operational BMPs:

- Store damaged vehicles inside a building or other covered containment, until successfully removing all liquids.
- Clean parts with aqueous detergent based solutions or non-chlorinated solvents such as kerosene or high flash mineral spirits, and/or use wire brushing or sand blasting whenever practicable. Avoid using toxic liquid cleaners such as methylene chloride, 1,1,1-trichloroethane, trichloroethylene or similar chlorinated solvents. Choose cleaning agents that can be recycled.
- Inspect all BMPs regularly, particularly after a significant storm. Identify and correct deficiencies to ensure that the BMPs are functioning as intended.

- Avoid hosing down work areas. Use dry methods for cleaning leaked fluids.
- Recycle greases, used oil, oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic fluids, transmission fluids, and engine oils (see Appendix IV-C).
- Do not mix dissimilar or incompatible waste liquids stored for recycling.

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil/water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in Volume V. Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in Section 4.6 of Volume V in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT Type 1L basins) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system

owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.

- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catchbasin.
- Post warning signs; "Dump No Waste - Drains to Ground Water," "Streams," "Lakes," or emboss on or adjacent to all storm drain inlets *where possible*.
- Disposal of sediments and liquids from the catch basins must comply with "Recommendations for Management of Street Wastes" described in Appendix IV-G of this volume.

Additional Applicable BMPs: Select additional applicable BMPs from this chapter depending on the pollutant sources and activities conducted at the facility. Those BMPs include:

- S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites
- S427 BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers
- S406 BMPs for Spills of Oil and Hazardous Substances
- S410 BMPs for Illicit Connections to Storm Drains
- S430 BMPs for Urban Streets

S421 BMPs for Parking and Storage of Vehicles and Equipment

Description of Pollutant Sources: Public and commercial parking lots such as retail store, fleet vehicle (including rent-a-car lots and car dealerships), equipment sale and rental parking lots, and parking lot driveways, can be sources of toxic hydrocarbons and other organic compounds, including oils and greases, metals, and suspended solids.

Pollutant Control Approach: If the parking lot is a **high-use site** as defined below, provide appropriate oil removal equipment for the contaminated stormwater runoff.

Applicable Operational BMPs:

- If washing a parking lot, discharge the washwater to a sanitary sewer, if allowed by the local sewer authority, or other approved wastewater treatment system, or collect washwater for off-site disposal.

- Do not hose down the area to a storm sewer or receiving water. Vacuum sweep parking lots, storage areas, and driveways regularly to collect dirt, waste, and debris.

Applicable Treatment BMPs: An oil removal system such as an API or CP oil and water separator, catch basin filter, or equivalent BMP, approved by the local jurisdiction, is necessary for parking lots meeting the threshold vehicle traffic intensity level of a *high-use site.*

Vehicle High-Use Sites

Establishments subject to vehicle high-use intensity are significant sources of oil contamination of stormwater. Examples of potential high use areas include customer parking lots at fast food stores, grocery stores, taverns, restaurants, large shopping malls, discount warehouse stores, quick-lube shops, and banks. If the PGIS for a high-use site exceeds 5,000 square feet in a threshold discharge area, an oil control BMP from the Oil Control Menu (in Volume V) is necessary. A high-use site at a commercial or industrial establishment has one of the following characteristics: (Gaus/King County, 1994)

- Is subject to an expected average daily vehicle traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area: or
- Is subject to storage of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.).

APPENDIX D

SOIL SURVEY DATA

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Clallam County Area, Washington

December 26, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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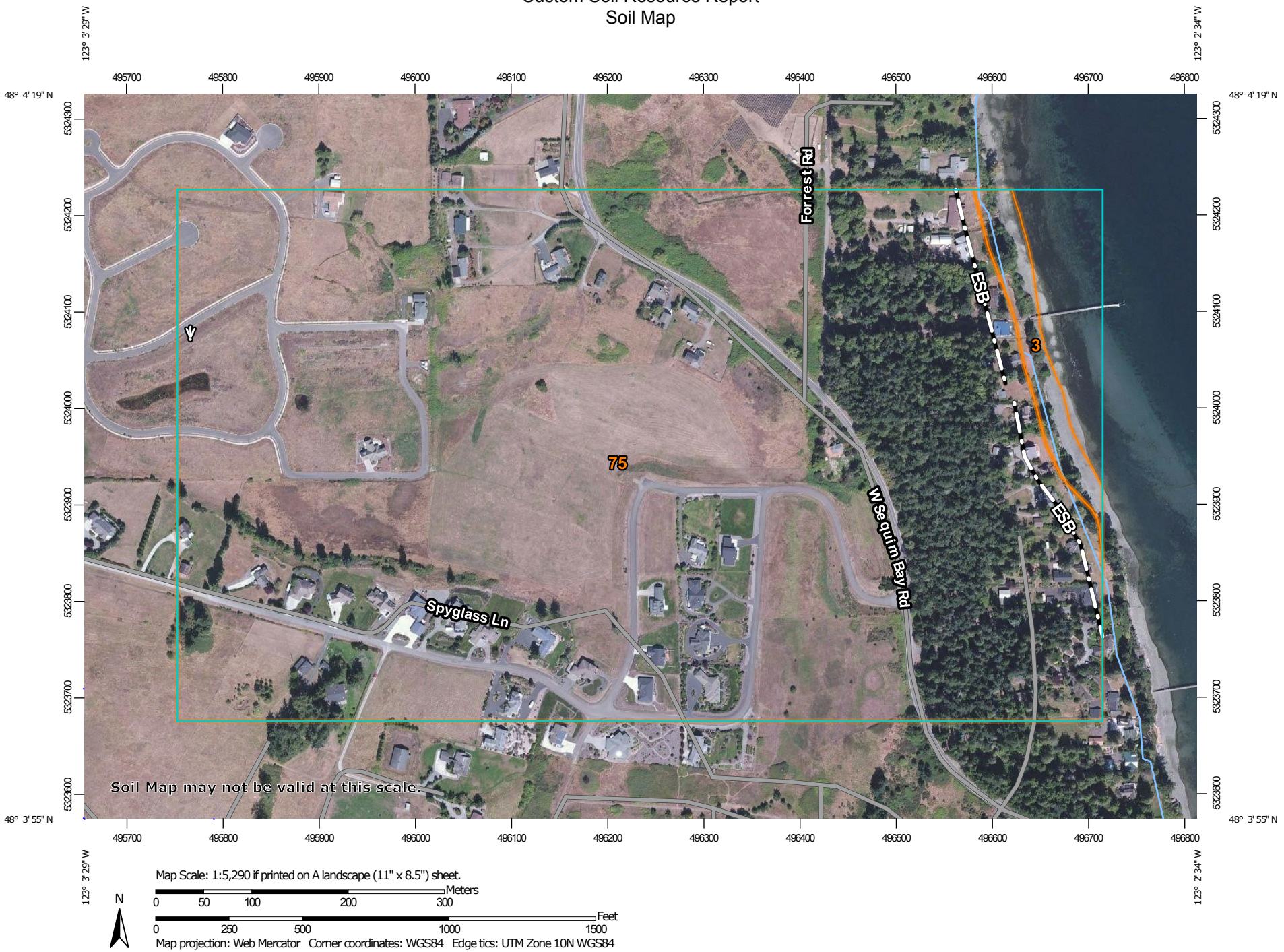
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,290 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clallam County Area, Washington
Survey Area Data: Version 16, Sep 10, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 9, 2010—Sep 3, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Beaches	2.7	2.1%
75	Yeary gravelly loam, 0 to 15 percent slopes	124.6	94.7%
Totals for Area of Interest		**131.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clallam County Area, Washington

3—Beaches

Map Unit Composition

Beaches: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beaches

Setting

Landform: Beaches

Typical profile

H1 - 0 to 60 inches: Error

Properties and qualities

Slope: 1 to 5 percent
Depth to water table: About 0 to 11 inches

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

75—Yeary gravelly loam, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2ghs
Elevation: 200 to 1,500 feet
Mean annual precipitation: 28 inches
Mean annual air temperature: 48 degrees F
Frost-free period: 160 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Yeary and similar soils: 85 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yeary

Setting

Landform: Hillslopes
Parent material: Glaciomarine or glaciolacustrine deposits over till

Typical profile

H1 - 0 to 7 inches: medial loam
H2 - 7 to 38 inches: gravelly clay loam
H3 - 38 to 60 inches: loam

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 20 to 40 inches to densic material

Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Forage suitability group: Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Mckenna

Percent of map unit: 4 percent
Landform: Depressions
Hydric soil rating: Yes

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